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Vol. VI. NEW YORK, JULY 11, 1885. No. 2

THE dinner given by Mr. Cyrus W. Field in London, on the 4th inst., to celebrities of England and America, and the telegrams passing between the two nations, were well worthy of the man who first bound them by the electric tie—the Atlantic cable.

AN original use of the electric light is seriously contemplated in Algeria. The intense heat there is almost murderous for Europeans, and thus they are hindered from engaging in agricultural work. It is now proposed that they shall harvest with the aid of arc lights.

NOW that the new Commissioners of Electrical Subways in New York have been sworn in, there is some curiosity to know what they will do. In any event, it is likely that those who have expected to see a wholesale burial of the wires will be disappointed.

ON page 20 will be found a full index of Vol. V. of THE ELECTRICAL WORLD, just closed. It will be found of great assistance in looking up articles, and gives an excellent idea of the variety and merit of the contents of the paper during the last six months.

WE understand that Prof. H. A. Rowland, of Johns Hopkins University, President of the Electrical Commission, has appointed Profs. Simon Newcomb, A. G. Bell and Abbe a committee to appear before Congress in behalf of the establishment of a Bureau of Physical Standards.

WE print this week the interesting paper by Mr. E. P. Thompson, read before the American Institute of Electrical Engineers, on the Wetmore helical spring clutch for arc-lamp carbons. The subject is an important one, and is fully dealt with in the paper and the subsequent discussion.

IT is to be hoped that with its new equipment of lightning rods, the Washington monument will be secure from further damage, and that the inhabitants of the national capital will be able to indulge without anxiety in their new and popular amusement of watching the lightning "go for" the monument, which ought to be competent to carry off any current that may come near the city.

A TELEGRAM from Pittsburgh, received as we go to press, states that Judge McKennan has granted a preliminary injunction against the Western Pennsylvania Telephone and Telegraph Company for infringement of the Bell patents. He also refused to allow the defendants to continue operations until a final hearing was had. It can hardly be said that this action comes as a surprise.

WE make acknowledgment to-day of further contributions to our fund, auxiliary to that of the New York *World*, for the erection of the Bartholdi Statue Pedestal. The *World* has already raised over $91,000, and has every reason to believe that it will have raised the remaining $9,000 in a week or two. We ask our readers who have lists, to send them in, therefore, as promptly as possible.

THE Mackay-Bennett cable seems to be waking up the old concerns, for they are disposed to inaugurate the worn-out style of suicide known as a "war of rates," by reducing the tariff to eight cents a word. This rate will not pay even a company not entirely waterlogged, but if the Mackay-Bennett combination can get them, loaded down as they are, to fight it in this peculiarly suicidal manner, it can stand it longer than they can.

A FEW good things are still to be had in connection with the telephone in Scotland. An amalgamation has recently been effected between the Dundee and District and National Telephone companies, leaving the latter in possession. The shareholders in the former company have been receiving dividends at the rate of 9 per cent. for nearly five years, and now the purchase price of their property secures them a bonus of not less than 40 per cent. on their capital.

IT may not be generally known that the government of India has a large telegraph establishment of its own, but such is the case, and from a long article in *Engineering* it would appear that the telegraph engineers are highly dissatisfied with their prospects, as they get salaries from which they can save nothing, and are required to work for thirty years in that hot, enervating climate before they can earn a pension. At the present time there is a complete block in promotion, and our contemporary calls for a change.

PROF. JOHN TYNDALL has devoted $30,000, being the proceeds of his lectures in this country, to the endowment of physical study at the universities of Harvard, Columbia and Pennsylvania. By judicious investment the sum set apart now amounts to $32,400, and the noble gift can be utilized at once. We hope and believe that physical research will be greatly benefited by this substantial help. The science of electricity—to go no further—stands greatly in need of research such as liberality of this wise and thoughtful character renders possible.

WITH the object of saving our friends a great deal of letter writing, we take this opportunity of informing them that full information respecting our Patent Agency, referred to in this column incidentally last week, will be found in the pamphlet which can be had of us on application, and in the announcement on the fourth advertising page of this issue. We shall, however, be glad to answer any questions, at any time, relating to patents in the general or in the particular, and to place at the disposal of our readers all the facilities we enjoy for the transaction of patent business.

DESIROUS of avoiding the iniquitous law limiting the charge for a telephone to $3 per month, some licensees in Indiana now propose to charge the $3 for the telephone, but to charge also $2 per month for the use of wires and other attachments. This is an evasion of the law, but the effort has our sympathies, and we should like to see it succeed. A subscription of $5 per month is little enough for good telephone service, and if people do not want the telephone they can go without it. Local legislation must not override the patent law and deprive patentees of their rights.

THE paper that we published last week on secondary batteries, by Mr. F. G. Howard, has won for its author the Miller Prize from the English Institution of Civil Engineers; but it has also called forth from Messrs. A. Reckenzaun, J. S. Sellon, Bernard Drake and others a mass of comments, objections and contradictions. The criticism is made, and fairly, we think, that the enumeration of results is not brought down near enough to the present time, and so fails in some respects to give the latest information as to the successful removal of evils and the accomplishment of ends sought.

IT seems to us that the meeting of the National Electric Light Association on August 18, in this city, should be attended by all who are interested in electric lighting and can do so. Matters of importance are developing and will be brought forward, and their consideration no active man can afford to miss. The benefits will accrue to those who attend, and not to those who stay away. The problems connected with electric lighting are many, and the exchange of experience must assist their solution. Besides, there will be promoted harmony and union and better understanding, from which in turn, and later, may spring outgrowths upon which the prosperity of arc and incandescent lighting alike may depend very largely.

AFTER all the extensive preparation for the increase of business, there will not be any sixpenny telegrams yet in England. Lord John Manners, who is once more Postmaster General in the new Conserative Ministry, says it is not the intention of the Government to proceed with the sixpenny telegram bill this session, "because of the contention the introduction of the measure would give rise to." As matters stand, perhaps it is as well for the Conservatives to avoid showing their numerical weakness in Parliament; but there are many other reasons, just as cogent, for not introducing the bill at this juncture. Still, sixpenny telegrams may come sooner or later.

OBITUARY notices of Prof. Fleeming Jenkin, whose death we mentioned last week, continue to appear in our European contemporaries, and they are without exception warmly laudatory. There are no new facts brought out to add to what we have already said about him, but we are forcibly struck with the depth of feeling everywhere evinced. The London *Saturday Review* sums up the sentiments expressed, in the following happy passage: "He has been described as 'intelligence personified;' but the description is only a half-truth at the best. It takes no account of the admirable human elements of which he was compacted, and leaves untouched the singular vivacity and completeness of his emotional endowment. He was not of those who discover the heart of their mystery to the first comer; not to know him intimately was to know him scarce at all. But to his friends he was a mine of qualities, an inexhaustible source of affection and respect."

IN view of the meeting of the U. S. Military Telegraphers of the Civil War, to be held in this city next month, it may not be too bold to remind some of the veterans that, in view of their services being available in any other possible war, they need to "read up," since their experience from 1861 to 1865 would avail them but little nowadays. We have no recollection of any successful endeavor to use the electric light during our late war, and it was five years after our war had ended that we found the French engineers turning the electric light around the forts of Paris, discovering for a mile distant, at the dead of night, German troops burrowing in the mines and trenches about the city. Since our war electricians have learned to lead wires from gun to gun in our ships and thus fire a broadside simultaneously, such a manœuvre being impossible where individual gunners fire at the word of command. It has been demonstrated that armor plate struck simultaneously in this way by a number of shot is thoroughly shattered, while an old-time broadside, where the bolts strike, even at fractions of a second, does no more than make an indentation. In fact, what we may call electrical warfare has been revolutionized since our veteran operators were engaged, as, for instance, in the case of an enemy "tapping wires," which was often done. Nowadays, tapping wires would be next to impossible. Every important military wire from Washington would be duplexed, not for dual telegraphing, but while an operator would be sending a military order in one direction, a clock in circuit at the other end would be sending back its steady "tick, tick," to confound the intermediate interloper, who would find the signals literally "all broken up." Our military operators of the rebellion may yet do the State some further service—better on account of their previous martial experience—but they must keep up with the steady onward march. There has been no faltering in the past few years telegraphically—not to mention a very efficient system of portable telephones—but we doubt if the subject is even now receiving all the attention that it merits. The old bugle call and the flag signals are of little use, for being either visible or audible, an enemy can interpret both equally as well as your distant friend; but the telegraph, silent, quick and sure, puts a girdle round the neck of your foe and strangles him. For these reasons we desire to see our veteran military telegraphers study assiduously the march of science in this direction, as their distinguished service in the past will, if they have kept pace with the course of events, render them doubly efficient in the future.

On the Measurement of Currents.*

BY M. E. HOSPITALIER, *in Comptes Rendus.*

The industrial apparatus for measurement give concordant results only with continuous currents such as those furnished by batteries and accumulator. When the current takes a decided undulatory form, as, for instance, the current furnished by an Anatole Gérard machine, in which it becomes periodically zero four times in each revolution, still remaining in the same direction the indications furnished by ampèremeters and voltmeters are always lower than those which would correspond to the true value of the electric energy consumed in the exterior circuit.

We have determined experimentally, with the aid of the pupils of the School of Industrial Physics and Chemistry of the City of Paris, and thanks to the kindness of M. A. Gérard, who has placed one of his machines at our disposal, the absolute value of the discrepancies between the measurements on supplying glow-lamps successively with continuous currents or otherwise.

The following are the results of our experiments:

When the lamps are brought up to the same luminous condition the indications of an electro-dynamometer introduced into the circuit remain the same, whether we make use of a continuous current or not.

The indications of a Deprez-Carpentier ampèremeter are on an average 10 per cent. lower with corrected or rectified currents than with continuous currents. The indications of a Thomson or a Deprez-Carpentier voltmeter applied at the extremities of the machine, are about 15 per cent. lower with corrected currents than with continuous currents.

We see thus that the nature of the current introduces differences which can by no means be neglected, since they cause us to attribute to one and the same lamp a consumption in voltampères or in watts too small by 23.5 per cent. when it is supplied by corrected currents.

The cause of the difference is that the indications of the ampèremeter are proportional to the mean intensity, and that the square of mean intensity introduced into the formula

$$W = R I^2$$

in order to calculate the mean work per second is always smaller than the mean of the squares of the intensity as inferred from the indications of the electro-dynamometer, which represents the real expenditure of the lamp.

It is the same with the voltmeter, which gives the mean difference of potential at the terminals of the lamp, but the discrepancy of the results obtained with corrected currents and with continuous currents is still increased by the self-induction of the voltmeter, which tends to enfeeble the mean current traversing it and to diminish its indications.

It results from our experiments, that in calculating the consumption of glow-lamps supplied by corrected currents, gross errors are committed if we take the product of the volts and the ampères indicated by magnetic apparatus for measurement, standardized with continuous currents.

This consumption can only be calculated exactly with corrected currents, by measuring the intensity with an electro-dynamometer and the difference of the potentials by means of the quadrant electrometer (idiostatic method), or of Cardew's voltmeter.

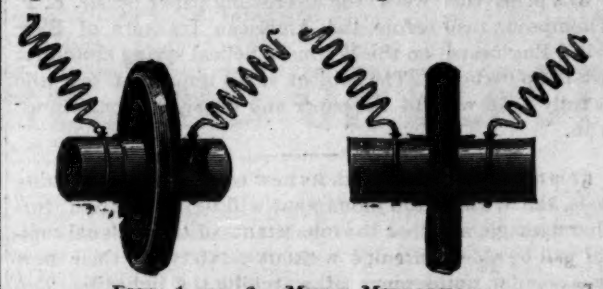
To What Electrical Invention is Due.

In the course of an address on democracy, individuality and public opinion, delivered before the literary societies of Colby University, Waterville, Me., on June 30, the Hon. Thomas B. Reed, member of Congress, said: "The ocean cable had to wait until there were two-score millions of people this side of the Atlantic. Had Alexander Graham Bell come over with the Pilgrim Fathers and invented the telephone, it would have been an idle toy. It took a world with myriads of people in it able to pay $40 a year each to make the telephone what it is. In James Watts' time, and just before, all the inventive minds were intent on the problem of steam. Why was this then and not before? You can see why if you examine the industrial condition of England at that epoch. They had reached the point of progress where only the steam engine was needed to drag countless wealth out of the bowels of the earth to make fabrics which should glut the market of the world. Why is it that in America we first reached those wonderful improvements in agricultural implements which have revolutionized the cultivation of the soil? It was because our vast prairies were beyond the hoe and the rake. Not only were inventive minds turned to the problem, but the grasping capitalist and the eager farmer were behind urging them on. To-day thousands and thousands of minds are at work on electricity. A hundred years ago you might have counted them with your fingers. A hundred years have made the world rich enough to have electric lights to make their cities blaze with illumination. They can afford and must have electric motors. Electric motors are sure to come. By and by we shall harness the tidal waves and make merchandise of the power of Niagara."

* Translation, London *Electrical Review.*

The Milde Telephone.

Among the numerous exhibits which attracted attention at the recent electrical exhibition at the Observatoire, Paris, is the telephonic apparatus of M. Mildé. The novelty in this system, as described by *La Lumière Electrique*, consists principally in the arrangement of the microphone. The construction of the latter is shown in Figs. 1 and 2, the former showing the box closed, the



FIGS. 1 AND 2.—MILDE MICROPHONE.

latter being a sectional view. Its construction is quite simple. It consists of two similar parts, which are united by a drop of solder or any other means which will permit of a movement of the diaphragms. Grains of coke, carbon, or other semi-conductor are then introduced into the box, so as to fill it to three-fifths of its height. The centres of the two sides of the box have short tube-like projections. Into these tubes, cylinders of carbon are inserted, which are insulated from the sides by having thin sheets of paper wrapped about them.

FIG. 3.—TABLE TELEPHONE.

FIG. 4.—DOMESTIC TELEPHONE.

It will be seen that this arrangement is very simple and is eminently adapted to portable apparatuses. M. Mildé, the inventor, asserts that the instrument acts equally as well in direct circuit as with the induction coil; it appears even that as regards distinctness the *tonality* is greater in the first case.

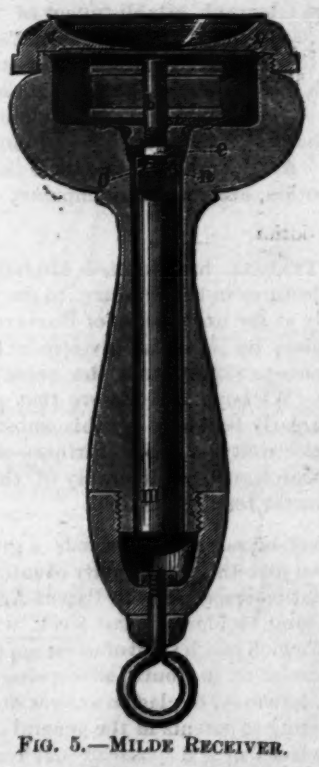


FIG. 5.—MILDE RECEIVER.

This form of transmitter has been adopted in various types, among them the portable set shown in Fig. 3, which is designed to be placed on a table.

The domestic telephone shown in Fig. 4, embodying the same microphone, was designed to comprise the least number of parts in the smallest space. The telephone, as seen in the cut, rests on a bracket of bronze or other ornamental material, within which is contained a Leclanché cell. When not in use, the bell is on the line. When called, however, the person responding lifts the receiver from the bracket, thereby automatically switching the line and current into the microphone.

We add a modification, introduced by M. Mildé, in the arrangement of the ordinary Bell receiver. The object aimed at was to remedy the liability of such instruments to get out of adjustment; especially those constructed of wood. As shown in Fig. 5, the receiver contains a cup *c*, to which the vibrating diaphragm *V*, *V* is soldered, and the core *b* is threaded and provided with a nut, so that an adjustment once made remains unchanged. The magnet *m* is screwed to the lower part of the core, so that the entire mechanism, being independent of the wooden casing, can be put together and adjusted before being placed within the latter. Thus all atmospheric or other influences which might affect the casing cannot derange the adjustment of the working mechanism, as this is entirely independent of the handle.

The Telephone That Was Wanted.

The following choice item is now on the rounds: "Mr. T. H. Brown, of Fort Worth, Texas, has perfected a magnetic telephone and telegraph which does away with batteries of any kind. It was tested over thirty-eight miles of wire Saturday, and proved perfectly satisfactory to telegraph men present, both as a telephone and telegraph. The instrument used was composed of two ounces of wire and half a pound of steel, and can be made for twenty-five cents. The transmitter is simply a horse-shoe magnet, either pole being covered with fine wire coiled carefully. The armature is a disc of steel, against which the voice is thrown, transmitted through the magnet to the wire. The receiver is similar, with smaller magnet. It is claimed by the inventor that he can transmit the voice around the world or across the Atlantic Ocean, there being no limit to distance, all that is necessary being the increase in size of magnet. The one used to-day, weighing half a pound, was capable of transmitting the voice seventy-five miles. The cost of batteries is said to be $100,000 yearly, which would be saved by this invention. In telegraphing the key attachment now in use would be applied, but very little noise would be made. The receiving operator would have a disc attached to his ear, hung by a hook in a cap, or strapped around his head. The noise now incident to telegraph offices would be done away with. No one could steal information transmitted to pool rooms, stock exchanges, etc. The telegraph would be absolutely secret. The inventor says, further, that the instruments could be carried on all trains, and, in case of accidents between stations, could be attached to telegraph wire, and notice given to any station just where the accident had occurred, its nature, etc., and this done in a few seconds. He also says a miner or diver could take an instrument attached to an insulated wire, go into a mine or water, pay out wire, and converse with a person at the other end. Messrs. Brown and Masterson go to New York this week, when Mr. Brown will make arrangements to obtain patents in France, Germany and England. These being secured, he will permit patents to issue in this country. It is possible the Western Union will buy the patent."

Underground Wires in Washington.

The annual report of Capt. F. V. Greene, the engineer officer of the District of Columbia, just made public, contains a discussion of the problem of placing telegraph and other wires under ground. Capt. Greene says: "It is to be noticed that in New York, Philadelphia and Chicago laws have been passed ordering the peremptory removal of all telegraph poles on a certain date. In all of these cities the dates have passed, and the laws have not been repealed, but the poles still stand on the streets. The interests involved are too great to permit the telegraph business of the country to be cut off in this summary manner. The placing of wires under ground in cities will require a large outlay of capital, and will consume a considerable amount of time. The work can only be done gradually. More progress has been made in Washington than in any other city in the country. The policy adopted by the commissioners, and consistently carried out for the last three or four years, has been to refuse permits for reconstructing pole lines within the central part of the city, and to permit extensions in the outer streets and in alleys, and on condition that a certain amount of underground work shall be done as an equivalent. The telephone company has been most in need of extension, and hence it has to-day the largest amount of underground wires. The electric light companies have been refused any permits except on the same terms, and they are still debating whether it will be profitable to accept them. No extensions of the electric light (except the underground line on F street) have been made in the last three years. The older telegraph companies, having their pole lines already established, have not until now felt the necessity of asking for permits. But the rotting of poles and the growth of trees carrying moisture into their wires have compelled them to make a beginning, and the same causes would in a few year effect the removal of all the objectional poles in the heart of the city, and thenceforth the placing of wires under ground would keep pace with the growth of the city, provided the commissioners retain control of the matter and pursue the same policy they have been pursuing. If the higher courts confirm the decision already made—that the commissioners have no legal right to make such agreements as they made with the Western Union company—then, of course, the matter will have to go to Congress for new legislation, in which it is to be hoped that the commissioners will succeed in increasing the power they have already exercised to prevent the aggregate increase of pole lines, and to compel the gradual removal of the most objectionable ones."

The Daft Electric Railway at Baltimore.

It can be safely stated that the first bona-fide business transaction in this country, where an electric motor for a street railway was ordered, manufactured and delivered, was completed within the last few months.

In the early part of last spring the Baltimore Union Passenger Railway Company, hearing of the rapid progress of the Daft Electric Light Company with their system of electric railroad lighting, and wishing to increase their carrying capacity, investigated the matter. Satisfied with the completenes of the system, an order was at once given to construct two motors and equip the Hampden branch of their lines.

It was some time, however, before definite plans were settled upon; but about the middle of last April work was commenced both at Baltimore and at the Daft works. On June 10 the first motor was shipped, after having undergone a week's severe testing. The Baltimore Union Passenger Railway Co., Edgar M. Johnson, President, T. C. Robbins, General Manager, is one of the largest in the

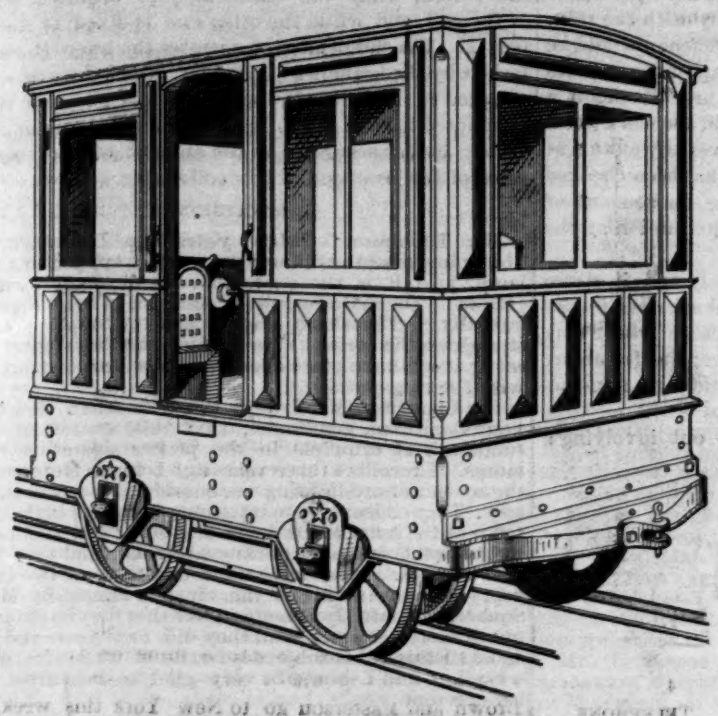


FIG. 1.—DAFT ELECTRIC MOTOR "MORSE."

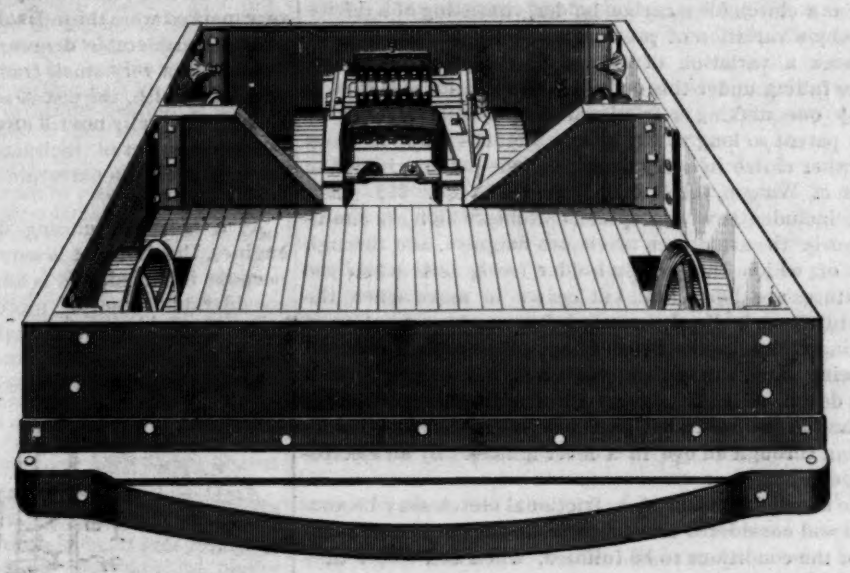


FIG. 2.—DETAILS OF DAFT MOTOR.

city. It operates 25 miles of roads, and has within its stables nearly 400 horses. The Hampden branch is just two miles long, runs through the villages of Hampden, Mt. Vernon and Woodbury, aggregating some 15,000 inhabitants, and is one of the hardest bits of line the company operates. Starting from the main terminus on Huntingdon avenue, there is scarcely 300 ft. of level road the entire length. The village of Woodbury, though not two miles distant, is 150 ft. higher than Baltimore. Grades and curves constitute the main features. The heaviest grade on a tangent is 319 ft., and on a curve 352 ft. per mile. The sharpest curve has a radius of but 50 ft., the largest 89 ft.

To equip this road the joints of the outer rails were perfected, and a third rail, an ordinary 25-lb T rail similar to the outer rails, laid, with the Daft patent insulator, midway between the outer rails.

The insulator, Fig. 3, consists of an iron shoe of diamond shape, 8 inches long, 3½ inches wide and ¼ inch thick, with two converging ways upon one of its surfaces.

Wedged between these ways is a round block of wood of truncated cone shape, with height 2½ inches. Upon this block is screwed a round iron cap. This is 4½ inches in diameter and 2 inches deep. Coming within ¼ of an inch of the iron shoe, it thoroughly protects the wood block. The rail placed on the cap is held in position by two bolts screwed into the cap. The difficulties of constructing such a work, it being all entirely new, have been many, but have been met and successfully overcome.

The centre rail forms the outgoing lead, the two outer rails with the ground being the return. The resistance of such a line will be less than .3 of an ohm, with perfect joints. At the main terminus a new building, forming one room 20 × 40 ft., has been built for the engine and dynamo. The engine is a 16 × 24 inch Atlas engine, built at Indianapolis. The boiler and all fittings are from the same firm.

The dynamo is one of the Daft company's largest. Its total weight is 4,200 lbs., and its maximum capacity is 300 ampères at 125 volts electromotive force. A 9-inch double belt connects direct from the 10-foot fly-wheel on the engine to a 15-inch pulley on the dynamo. Switches, regulators, automatic cut-outs and all other safety devices necessary for a complete system will be put in, as precautionary measures against every possible form of danger or trouble.

The construction and appearance of the motor for this line is fairly represented by the cuts. Its name, as will be seen, recalls the important connection of Professor Morse with the city of Baltimore.

Over all, the motor measures 12 feet 6 inches by 6 feet 6½ inches. The frame is constructed of 2½ × 19-inch ash, bolted together and braced with 4-inch angle iron. The inside dimensions are 9 feet 1½ inches × 5 feet 11½ inches. The wheels are standard car wheels, but with specially deep flanges and wide treads; they are 30 inches in diameter and have 5 feet centres.

The cab is built in the ordinary manner. It is finished inside with ash and black walnut, and is very neat and substantial. The receiving machine is a compound series motor capable of delivering 8 H.-P. Its total weight is 1,100 lbs., the armature being 196 lbs. The compound nature of the field permits of a wide range of resistances, and hence of magnetic strength of field. As the armature-speed depends, in a certain sense, upon this field, a perfect means of regulation of speed is obtainable.

Motion from armature shaft to car wheels is obtained by internal gears. Upon each end of this shaft a 3-inch phosphor bronze gear is keyed.

These engage with large gears, 27 inches in diameter fastened to the axle of the driving wheels. By this arrangement the energy of the armature is utilized practically almost directly upon the periphery of the driving wheels. The speed of armature to drivers is as 9 to 1. Therefore as the wheels must make 509 revolutions to the mile, the armature makes 4,581 revolutions.

The ratio of peripheral speeds, however, of armature to drivers is as 3.27 to 1.

As high speed is the normal condition of an armature, no real sacrifice is made to gain leverage. The speed of armature for 8 miles an hour, the limit the law allows, is 610. To take up all back-lash of gears, the motor is arranged with pivoting bearings at one end and a regulating

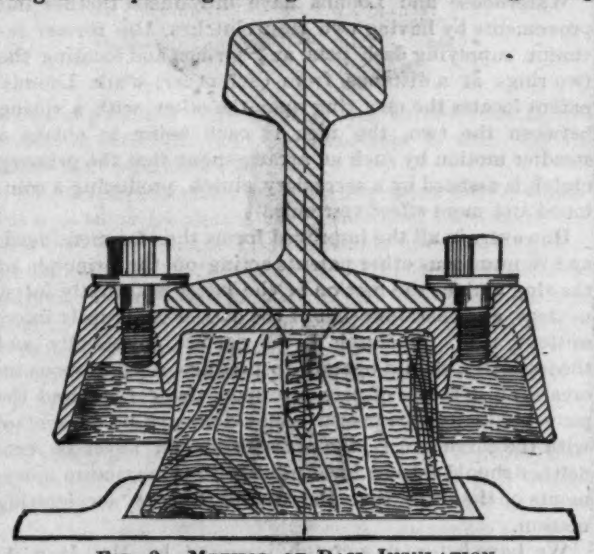


FIG. 3.—METHOD OF RAIL INSULATION.

screw at the other, both resting upon heavy peces of rubber. This pivoting arrangement is again advantageous in case of repairs, or inspection through accident; the large gears being held in place by means of a set screw and long spline. On loosening the set screw, they can be easily removed along on the axle, freeing the small gears. The motor then can easily be raised to a vertical position allowing free inspection. The total weight of the Morse is about 4,200 lbs.

The wiring and controlling mechanism is equally as simple and substantial. No. 4 B. & S. underwriter's wire is used throughout. It is run in grooved sheathings, and covered so that no wire is to be seen excepting at motor. Every precaution was taken to obviate any danger arising from moisture or short-circuits.

The controlling device consists of four heavy brushes bearing upon a stout frame of soapstone carrying broad and properly shaped contact pieces. This whole is inclosed in an 8 in. by 16 in. iron box, with an ordinary engineer's handle and guide.

Four movements are made, controlling the combinations of the field magnets, which vary from .39 to 3.75 ohms. The resistance of armature is .24 of an ohm. By proper connections with the switch, it can be readily seen that the motor can be slowly and easily started, stopped or run. By turning a small handle placed just to the left of the main switch, either to the right or left, one of two pairs of brushes is brought to bear on the commutator, thus giving the directive motion to the armature, and obviously to the car.

Another switch just to the right of the main switch is a dead cut-off controlling the main current coming from the contact wheel. This is placed underneath the car, and consists of a heavy 14-inch wheel of phosphor bronze, free to slide 4 inches to the right or left, and rotating freely upon its shaft. A deep groove is cut into the rim, fitting the centre rail. By a lever and a heavy spring a constant pressure tends to keep the wheel down on the rail. By this arrangement the wheel can adapt itself to every curve or change of level of the rail. An ordinary hand brake is placed in the car just to the left of the switches. By this handy arrangement, one man, with a little practice, can easily manipulate the switches and brake, and so control the car.

Before shipment the car was thoroughly tested, and worked admirably.

At Baltimore a few preliminary tests have been made over the entire length of the line. Although all arrangements have not as yet been completed, most excellent results have been obtained, insuring its perfect success. At present, 60 round trips are made per day, each occupying 45 minutes; and 29 horses are necessary to operate the line. On many of the grades and curves the two horses are taxed to their utmost. With proper joints bringing the resistance down to 50 per cent. above the theoretical, making the total resistance about ·5 of an ohm, the motor is estimated to haul two cars over all the curves and grades, and make a saving of nearly 50 per cent. in time.

G. W. M.

Dynamo-Electric Machine Armatures.

To the Editor of The Electrical World:

SIR: Will you please answer the following through the columns of your valuable paper:

1. Which would be the more efficient for a motor, an armature of the Gramme type, or one of the Pacinotti type?

2. When a Gramme machine is run as a motor, what causes the armature to revolve; is it the attraction between the wire of the armature and the poles of the field magnet, or is it indirectly—*i. e.*, by magnetizing the armature core and the attraction between it and the field magnet, or is the motion due to the attraction of both for the field magnet?

A. B.

ANSWER.—1. We know of no experiments relating to this question. With proper construction we believe one to be as good as the other.

2. The revolution of the armature is caused by the electro-magnetic action of the current in the wire exerting attraction upon the field magnets. The iron core is not an absolute essential, but its presence increases the efficiency of the machine by concentrating the magnetic field upon the coils. Read some good elementary work on electricity and magnetism, such as Jenkin's, Thompson's or Avery's.

A CABLE-RATE WAR AHEAD.—On the 4th inst. the different Atlantic cable companies held a conference through their respective representatives, and considered a proposition to lower the tolls to eight cents a word in order to fight the Bennett-Mackay competition. Decision on this was postponed until the Gould cables shall have been repaired, when, it is understood, a war of rates will be naugurated against the Commercial Cable Company.

The Electric Arc Lamp Frictional Clutch.*

BY EDWARD P. THOMPSON, M. E.

The object of this paper is two-fold—to bring before the society a new invention, of which the writer is not the inventor, for the purpose of soliciting from electricians their criticisms and opinions. The opinion of the writer, in the first place, obtained from his investigation of existing patents, of models of the lamp, and of the important modifications capable of being made, is that the patent is valid, the invention is ingenious, the device is simple, and the result is a non-vibrating movement of the electrode and an absence of dash-pots and other means of compensating for sudden variations of current.

The second object is to make the members have the same opinion. Assuming this to be a difficult task, he desires, as follows, to make an analytical investigation of the development of the frictional clutch.

The well-known trick of a ball and string passing through a crooked hole in the ball, whereby the loosening and tightening of the string cause the ball to fall and to stop respectively, operates upon the same principle as the frictional clutch, and the principle may therefore be defined as a clutch for a carbon holder, consisting of a device whereby a variation of pressure upon the carbon holder produces a variation of motion of the electrode. Any device falling under this definition is a frictional clutch.

Any one making a frictional clutch will infringe no one's patent so long as he makes a clutch different from any other clutch in every detail; for the patent granted to Slater & Watson, of London, in 1852, No. 212 (English), includes two superposed clutches which are simultaneously the armatures of electro-magnets, and through both of which the carbon holder freely falls when the armatures are horizontal, but ceases to move when the armatures are inclined, exactly in the manner of action of the ring clutch in the Brush lamp. The patent referred to, being dated thirty-three years ago, has expired. It is fully described in Dredge's "Electric Illumination," page 387, and in the appendix, page xxxvi., as a carbon holder passing through an eye in a lever actuated by an electro-magnet.

The above definition of a frictional clutch may be analyzed and considered as a problem for the purpose of arriving at the conditions to be fulfilled, when and where they should be fulfilled, and in what manner.

In the steam engine, variation of pressure was formerly obtained in the cylinder, and is at the present time, in some instances, by means of the movements of a throttle-valve located at a distance from the cylinder. In the improved forms of engines the device for varying the pressure is located in the cylinder itself, and the slide valve is employed both as a means of admitting the steam and as a means of regulating the amount admitted, and in all departments of industry it is advantageous to locate a regulating device as closely as possible to that which needs the regulation. Therefore, is it not necessary that in an arc lamp frictional clutch, all the regulation of pressure take place at the carbon holder itself, and not by means of dash-pots, springs, etc., located at the ends of levers which are endowed with the unremovable property of inertia and weight? Evidently it is preferable.

The variation of pressure in the electrodes of telephone transmitters all takes place, in the improved instruments, within the limits of constant and complete contact. Upon small variations of current in the case of the ordinary ring clutch, the ring and the carbon holders are not always in contact, especially if the variations of current are very great, and more especially if the dash-pot is not attached. The consequence is that the carbon holder falls a greater distance and with greater suddenness, and stops also with a greater suddenness than if the friction were not entirely removed.

Some have said that the unsteadiness of the arc lamp is due to the poor quality of the carbon; others, to the defects in the generator; others, to the cutting in and out of other arc lamps; others, to poor construction of the system in general; and others, to all these combined: while they seem to think that the clutch has reached its perfection and there is nothing to be said against it; whereas, according to the definition, a clutch could certainly be made which would produce alternate darkness and brightness at almost any rate.

We may safely say that the steadiness depends upon the clutch more than upon anything else.

The intensity of the light and heat depends upon the length of the arc. Therefore, the intensity of the light due to incandescence of the electrodes and to their combustion depends upon the length of the arc.

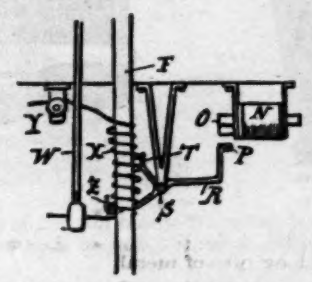
The length of the arc depends upon the electromotive force, upon the shape of the electrodes and upon the distance apart of the electrodes; or the arc may be kept constant in length by varying the distance between the electrodes every time the other named variables change; in short, the steadiness of the light or length of the arc depends upon the quickness and definiteness with which the distance between the electrodes changes after the other variables have changed, and upon the steadiness of movement of the electrodes.

* Read before the American Institute of Electrical Engineers, May 20, 1885.

Coming now to the action of the ring clutch and all its modified forms and adjuncts, let its operation be analyzed thus, with as little reference as possible to any other part of the lamp. When the ring is horizontal, the carrier of the carbon electrode is free to fall. When it is inclined at its maximum, the carrier is retained in a fixed position. At a certain point of inclination, the least increase or decrease of inclination will cause the carrier to fall or to be retained from falling. If the increment or decrement of inclination be infinitesimal, the carrier and clutch are still in contact, and the friction existing between the two surfaces diminishes the velocity as it tends to increase, and thereby gives the holder a uniform motion through an infinitesimal distance; but the increments and decrements of inclination of the ring are not infinitesimal, and therefore the ring and carrier are not in contact when the decrements of inclination occur, although the period of non-contact is very short. The consequence is that the velocity of the carrier increases as the square of the distance during the time that the ring and carrier are out of contact. To take the place of this lack of the retarding effect of friction, inventors have supplied a dash-pot whose piston is connected directly or indirectly with the ring. This is a help, undoubtedly, and its efficiency would be very marked were the individual movements of the carriers of any considerable degree; but as they are all within a distance of a very small fraction of an inch, such as a tenth or a hundredth, the piston scarcely acquires any motion at all, and especially not till after the carrier has been checked by an increment of inclination of the ring, on account of the inertia of the parts and lack of definite motion at the connecting joints.

As a means of closing doors noiselessly and in steam engines, the dash-pot is very desirable and effective for the purpose intended, and is adapted in all cases where any considerable extent of motion takes place; but for an arc lamp clutch it is theoretically and practically a non-success.

Several patents have also been taken out involving a



NEW ARC LAMP CLURCH.

spring attached to the ring, so that the motion of the carrier will be retarded when the ring is inclined. This may be called an improvement from some stand points, but the fact still remains that the carrier and ring, even with the spring attachment, do not remain in contact, and therefore the movements of the latter, being vibratory, the movements of the former are vibratory also, and not only vibratory, but jerky, as familiar to all versed in the art.

Waterhouse and Loomis have introduced further improvements by having two ring clutches, the former inventor supplying dash pots and springs and locating the two rings at a distance from each other; while Loomis' patent locates the one ring upon the other with a spring between the two, the idea in each being to obtain a steadier motion by such an arrangement that the primary clutch is assisted by a secondary clutch, producing a combined and more effective result.

However, in all the improved forms thus far mentioned, and in numerous other patents acting on the principle of the ring clutch, the motion of the latter is abruptly intermittent, and therefore that of the carrier is abruptly intermittent also. A clutch to be perfect, practically and theoretically, should operate to produce a continuous increase or decrease of pressure upon the carrier, and the piece producing this pressure should always be in contact with the carrier; *i. e.*, the pressure should never be zero, neither should it be so far diminished for maximum movements of the ring that the carrier has an accelerating motion.

We have before us a clutch invented by Mr. Jean A. Wetmore of this city. It combines within itself all the qualities and fulfills all the conditions required.

Its true value will be appreciated upon inspection of its construction and operation. As seen, it consists of a cylindrical coil spring through which passes the carbon carrier. By certain manipulations of the spring, the carrier may be regulated in its movements with the utmost nicety. If the spring is bent laterally, the carrier is lifted. If the spring is partially straightened again, the carrier is subjected to less pressure, and consequently its own weight causes it to move downward, not with an accelerated, but uniform motion, becauses the coil spring, tending to straighten itself, constantly presses against the carrier. It may be manipulated by the hand as easily as a ring clutch by electro-magnets, showing that its good results are not dependent upon the delicacy of action of the operating force. Accordingly, when operated by electro-magnets in the main and shunt circuits, the carrier is regulated so perfectly that the light is almost as steady as that of an incandescent lamp.

This clutch may truly be said to act by causing a variation of pressure upon the carrier. It may be operated effectually by the separate action of the shunt and main magnets, or by that of both, as in most ring-clutch lamps. The application of both magnets to its action is as simple as in the coil spring itself, and is accomplished by arranging the main magnet to *bend* the coil by a lateral pull upon its lower end, and the shunt magnet to straighten the coil by means of a forked lever, each end of which acts upon the opposite ends of the coil spring respectively and in opposite directions. There are several modifications adapted to be applied to cause the clutch to act, and the general mechanism may be the same as or different from that of any other lamp. Mr. Wetmore has shown as much genius and simplicity in the details of construction of the whole lamp as in that of the clutch itself.

When the main and shunt magnets are both employed to operate the clutch, the arrangement of the levers is as shown in the drawing.

F shows the carbon holder, and the helical line shows the clutch, while the main magnet operates the end of the coil, and while the other end is fixed to the support *Y*. The shunt magnet operates the lever *R*, which is forked by the branches *T* and *Z*, the two arms being adapted to straighten the spring, while the main magnet is adapted to bend the spring and thereby retain or lift the carbon holder according to the amount of movement upward of the lower end of the coil spring.

DISCUSSION.

Mr. Thompson: Thirty years ago Lacassagne and Thiers invented the differential magnet applied to the arc lamp, and it is the preferable form to apply with any clutch. The main magnet is modeled to bend the spring laterally. The shunt-magnet acts on opposite ends to straighten the spring. There is no great movement necessary; it will take place even in a smaller distance than with the ring-clutch.

The Chairman (Mr. Sydney F. Shelbourne): It seems to your Chairman, gentlemen, that this matter involves a fundamental principle in the proper operation of arc lamps. I recollect three years ago being in Montreal when the matter of arc-lighting was considerably newer than it is now. They endeavored to introduce arc lamps in the dining-room of the hotel where I was stopping; but suddenly the lights went out and darkness reigned, and they had to resort to gas. I also have noticed in the past two or three years the operation of the cluster lamps in Madison Square, and latterly it seems to me that they have operated much more perfectly than they did two years and a half ago. I think this subject is fertile of discussion and observation, and I should be very glad to hear from members present.

Mr. J. F. Kelly: I understood Mr. Thompson to say that what would occur in large movements would certainly occur in small movements, and I think I understood him to say shortly before, that what would occur in large movements with the dash pots would not occur in small movements. Is there not some inconsistency there?

Mr. Thompson: I mentioned and intended to keep distinct three classes of movements. One is infinitesimal, the second are small movements and the third are great movements, and all those take place in the action of an arc lamp. You can conceive of a solenoid and its core where variations of current will cause that core to vibrate. In the telephone the movements can be called practically infinitesimal. Then we speak of small movements where we would vary the currents so as to produce movements, but you could not see them. The latter would be thousands of times larger than an undulatory current produced by speech and yet they would be so small that you could not see the movements. Then the other class of movement are those that are visible. All these movements occur in ordinary arc lamps. The dash pot is not affected by the first named, while only the first two movements occur in the arc lamp under consideration.

A Member: I understood Mr. Thompson to say that this motion was so uniform that the force of gravity did not act as an acceleration. I understand that the movement is slow on account of the resistance offered by the successive rings of the solenoid. I suppose the statement was meant to be literally exact.

Mr. Thompson: The principle is known of course that friction does not increase with the velocity except in the case of iron against iron. It is thought that the friction varies somewhat with increase of velocity. I do not remember whether it increases or diminishes; but this, however, does not depend upon that principle. You noticed that when the holder was allowed to fall (and I was trying myself not to perform any trick) it moved with a uniform velocity. That would not take place if I took the rod and pressed against it with some hard substance and kept a uniform pressure on there; so the explanation must be that just as soon as the rod begins to move it causes the spring to spread out, and whenever a spring spreads out it tends to spread in again, and its spreading in would prevent the carbon holder from increasing its velocity.

Mr. E. P. Roberts: I understand Mr. Thompson to claim that the motion is so uniform that it does away with all necessity for a dash pot. If that is correct, I should say it would be most valuable in many places. I have had experience with dash pots freezing up. One day last winter out at Cheyenne it took four men all day to trim 22 street lamps. In the summer you have to take them down from the poles every one to two weeks. An arc lamp has been recently patented, the coil spring in which will pull apart when it is to lift up, and when the carrier is to drop, the coils come close together and increase in diameter, and therefore the carbon rod drops. That motion is quite different from this.

Mr. Thompson: That patent was granted to B. L. Tibbitts seven months after this one was issued, and it was thought of by Mr. Wetmore and was tried, but it has the same fault about it as the ordinary ring clutch. Besides if you try to straighten out the spring so as to decrease the diameter of the coils—perhaps somebody knowing more about mathematics could tell how far that would have to be straightened in order to diminish the diameter a given quantity. I suppose that what you would have to do would be to measure the length of the spring and measure the diameter and then measure the length and

form a simple proportion which would give the subsequent diameter of the coil. But it is apparent enough that in order to decrease the diameter one-tenth of an inch you will have to pull this about one inch. I pull that about three inches now (illustrating) and yet the diameter looks just about as big. That is one fault about it. Another is that as it increases or decreases, of course all the diameters of those coils vary simultaneously at the same rate. They either hold the carbon rod or they let it fall.

Prof. W. A. Anthony: I have been very much interested in this paper, and the device seems to me very ingenious and very useful. I rose merely to speak of what I conceived to be the theory of the action of the thing. I understand from Mr. Thompson that his idea of the action of friction is that it does not depend on the velocity except in some cases; but I have found by actual experiment that in all cases of very slow motion the friction does depend upon the velocity and that it increases with the velocity in the case of iron upon iron, and wood upon iron, and brass upon brass. After the velocity reaches a certain—not a very large—amount, a velocity of a foot a second or something like that, then the friction becomes very nearly uniform and even diminishes somewhat, but at first the friction does increase and increases considerably with the velocity. Now it seems to me that that explains very well the whole action. The pressure of the spring upon the carbon rod is a very light one, and it varies only through small amounts by a considerable motion of the magnet, as I conceive it. Now, if the pressure is diminished somewhat, the rod will go faster and so increase the friction by an increase of velocity; and if the friction is equal to the weight of the rod, then the rod will move with a uniform velocity. It is perfectly well known everywhere that when the forces acting on a moving body balance each other, the motion is uniform. Now, if an increase of velocity increases the holding force, and makes it equal to the weight of the rod, the rod will move with a uniform velocity, and that up to any velocity that would ever be allowed in the case of a moving carbon holder; so that it seems to me that that does fully explain the action.

Mr. Roberts: On the subject of not leaving the manipulation of arc lamps to unskilled labor, I may say that, of course, there are places where the labor is almost ignorant, but the arc lights where they are in general commercial use are not in unskilled hands. I have had a good many arc lamps of different styles, and I think they all need regulating of some nature or another. Any disarrangement of parts which could not be fixed by ordinary means of course would not be desirable, but I think that most men would be able after a while to adjust a spring or anything like that about an arc lamp. I think it would only be lamps that were made for special purposes where the consideration of not having to readjust a spring or a dash pot or something or other would have to be thought of.

The Chairman: I understand that Mr. Wetmore, the inventor of this means of adjusting the holder of this carbon, is present, and as it does not require a formal motion, unless there is an objection on the part of the members of the society. I shall call upon Mr. Wetmore. He probably has gone through all the theories and views and studies relating to this method of adjusting the holder of carbon, and I ask him to give the society his ideas and his experience on the subject.

Mr. Wetmore: I have had some little experience in running different forms of electric lamps, arc lamps more especially, and they are continually getting out of adjustment and giving trouble. Another thing is that they are too complicated in a certain respect. A great many of those lamps have to be put into the hands of inexperienced men, men who are not well informed as regards the principles of electric lighting, and I made up my mind that it was almost a necessity to get the lamp as simple as possible, to make the parts perform as many offices as possible, and require as little adjustment as possible. Now this method of using a spiral spring for the clutch is the one I employ. This spiral spring not only has a clutch, but I may add it forms an electric contact between the incoming wire and the carbon holder. Of course this spring is always in contact with the carbon holder and the current is not interrupted, so that I make the spiral spring perform the action of a clutch, of a dash pot, and of an electric contact with the carbon holder. It is very easy of adjustment and requires very little attention. I do not know, gentlemen, that I have anything further to say in regard to the matter.

Mr. Roberts: I would like to ask Mr. Wetmore whether in running his lamps he finds any burning on his rod and whether he uses any other contact besides his spiral spring?

Mr. Wetmore: When I first started to experiment with it I found that there was a tendency to heat, but no burning; that was when I employed a very light spring; but you will see that the spring I have here is of quite heavy diameter, and I found that in employing that and adding the weight of the carbon to the weight of the carbon holder, it gave me a perfect electrical contact between the spring and the carbon holder, and I found no difficulty whatever in respect to burning. There were three principal points of contact in that spring with the carbon holder, and each principal point of contact is composed of several points of contact. If you will allow me I will explain that. The spring in its normal condition is perfectly straight. I pinch it in that condition and you see it is perfectly solid (illustrating). Now what is the condition? There are three points of contact there. That is one principal point. Here, commencing on this side, there are several—eight or ten or fifteen. There is another principal point of contact composed of several contacts, as you see. On this side again there are one or two. Now again I employ the shunt circuit to release these coils, and in what way? The main circuit may be in operation and clutch it tightly. Now if there is more current going through the shunt circuit, I employ that shunt circuit and press in on the two sides. The result is that the spring is straightened and the carbon falls down slightly. All that is necessary is to have two forked pieces right there to press in on that spot.

Mr. Frankland Jannus: I would like to ask Mr. Wetmore one question: Whether there is enough difference in resistance between the clutch and the carbon rod at the period of feeding to affect the light? When it lets go, when the rod moves and of course the contact is very materially lessened, does the difference in resistance then affect the light? Is there enough difference in the resistance to affect the light?

Mr. Wetmore: That is so far as interrupting the current?

Mr. Jannus: Yes.

Mr. Wetmore: No, sir; there is not. That spiral spring is always in electrical contact with the carbon holder at all times.

Mr. Jannus: I appreciate that point; but when it feeds of course it is in a position of holding together. When feeding takes place there is just as little contact as there can possibly be. Now at that time, I want to know, is there a sufficient difference in contact from what there is when the carbon holder is stationary, so as to make any difference in the light?

Mr. Wetmore: There is always frictional contact with this clutch, and that differs radically from the contact of a common clutch; that lets down suddenly, allows it to drop down quickly. With this it is constant and gradual, it is an easy sliding down.

Mr. George A. Hamilton: I presume the resistance is so small compared with the resistance of the arc itself that it makes very little difference.

Mr. H. B. Slater: If I understand the question of Mr. Jannus, it presupposes the case of an irregular motion when this spring feeds, or allows the carbon to feed; hence, that there is a variation in the pressure of contact, and consequently a variation of resistance. As I understand the explanation of the inventor, there is a constant and regular motion, and therefore a constant and regular pressure there. Thus there would be no variation in the resistance.

Mr. F. L. Pope: I think that the fact that there is no perceptible burning at the point of contact shows very conclusively that there is no resistance there. The production of resistance at the point of contact of the spring with the carbon holder, if it produced heat, would be just so much heat subtracted from the heat in the arc, and would produce a variation, but we find as a matter of fact, as the gentleman said, that no injurious heating is shown there. It is very evident that there can be no injurious resistance there.

Mr. Thompson: The weight of the carbon holder and the carbon is considerable. In order to retain that in a permanent position it requires a force equal to the weight. That force is the pressure with which the two are in contact, and of course there is no sparking or burning.

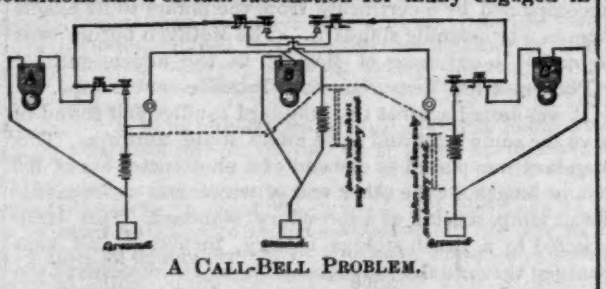
Prof. Anthony: In connection with just this point, I want to say that we have a carbon holder, a carbon rod of so much weight as there is in connection with an electric lamp, which is held so that it moves steadily with a slow motion. There must be sufficient pressure on that to carry the electric circuit without any appreciable resistance. Now if there is here a sliding, and not an actual letting go and allowing it to drop, such a slow motion necessitates a constant uniform pressure on the rod, which is sufficient to reduce the resistance to something very little—almost nothing in comparison with the arc.

The Chairman: Your Chairman is not an expert in arc lighting, but a query is arising in my mind as to whether any difference is produced in the action of this spring as the carbon itself becomes consumed, and therefore makes less weight to the carbon holder.

Mr. Thompson: All I would say would be that that amount of weight taken off would not amount to much, as 75 per cent. of the weight is due to the carbon-holding rod, which is a long tube of metal.

A Problem in Call-Bell Circuits.

The mapping out of electrical diagrams to fulfil certain conditions has a certain fascination for many engaged in



A CALL-BELL PROBLEM.

electrical pursuits. This taste applies to the running of circuits in particular, and an occasional *problem* of this nature may stimulate thought.

We publish, therefore, the problem given above, which was sent to us by Messrs. C. E. Jones, of Cincinnati. It grew out of a request for an estimate to be made upon a simple call-bell outfit; there were to be three bells or stations, so arranged that either could call either of the other two; and, if possible, the circuits were not to use more than two, or at most, three wires.

The following are the special conditions to be fulfilled:

I. There are to be three bells, one at each of three stations, *A*, *B* and *C*.

II. Only one bell must be rung when a call is made [this is to economize battery power.] For instance, if *A* wants to call *B*, he presses his key and rings *B's* bell without ringing his own. When *B* answers he presses his key and rings *A's* bell without ringing his own.

III. Each station must be able to call both of the others, not necessarily by one key, but by one or more keys.

IV. Single or double contact point keys may be used.

V. *Separate battery* may be used at each of the three stations, providing not more than two line wires connect the stations.

VI. Three line wires connecting the stations may be used, providing only one battery is used.

VII. The bells must all be on open circuit.

VIII. Either or both ground and metallic circuit may be used.

IX. No switches are to be used.

The problem was presented to the electrical class at the Mechanics' Institute of Cincinnati, and several solutions were obtained.

The diagram given below is that sent to us by Messrs. Jones & Bro. It will be understood that the double-contact keys shown are simple spring-lever keys with upper and lower contacts; they remain closed on upper contact at all times except when pressed on to lower one for putting on battery. The *single dotted line* shows where the third wire is to be added when only one battery is used. The *double* dotted lines show the battery and connections to be taken out when the third wire is added.

The Baltimore & Ohio Telegraph Headquarters Burned.

A serious fire occurred on July 4 at No. 63 Broadway, the general offices of the Baltimore & Ohio Telegraph Company. It is thought that the fire was started by firecrackers which the messenger boys in the basement had been exploding during the day. A police officer was walking through Rector street at 8 o'clock P. M., when a man ran to him and said there was a fire in the rear basement of the building, which extended from Broadway to Trinity place. The officer seeing smoke issuing from the basement, at once gave the alarm. Before the engines reached the place, the flames, bursting up the air-shafts, had reached the upper stories, and the whole building was soon in a blaze. There was danger that the fire would extend to the Adams Express building on one side and to that occupied by the American Express Company on the other. Three alarms were sounded, and engines and hook and ladder companies went tearing down Broadway. Stationed in front and rear, they soon had powerfu streams playing into the building, but the interior was a mass of flame, and before the fire was extinguished the building was almost completely gutted.

Twenty-one young operators were at work on the top floor, Broadway front, under Chief Night Operator Moffatt, and Electrician H. F. Dodge was there also. A young operator who sat near the open doorway was the first to smell the smoke, and jumping from his chair he yelled to his companions, "Get out, boys; the house is on fire!" Several of the younger operators, it is said, tumbled down the stairs in their hurry. Chief Moffatt advised the others to try the roof. A month ago a suspended ladder, to furnish easy access to the roof, was hung in the centre of the long operating room. When not in use the ladder was drawn up and rested parallel with the ceiling. Mr. Moffatt lowered it in a twinkling by loosing the string which kept it in place, and the foot of the ladder dropped and rested on a long operating table. The operators were not long in getting to the roof, and Moffatt and Dodge were the last up. All made their way, without any accident, down through the adjoining building into the street.

After two hours' work the fire was under control, The basement, the first floor and the fourth and fifth floors were burned out. The basement of the building was occupied as the telegraph company's storerooms, the cashier's office, and delivery and messengers' room. The building, which is insured for about $50,000, is damaged at least $30,000, and the Baltimore & Ohio Company estimate their loss at $40,000.

All the messages on the hooks of the telegraph office were saved and sent to the Brooklyn office for transmission.

Temporary offices were secured as soon as possible, next door, 61 Broadway, where necessary apparatus has been put in with the greatest dispatch. By 5 P. M. on Sunday all the leased lines of the company had been repaired and were in readiness. The work of renewal went on actively throughout the early part of the week, and it was not long before the entire service was practically in its wonted condition of efficiency. Too much praise cannot be given to the officers of the company and their aides for the zeal with which they worked in bringing order out of ruin and chaos. It is fortunate that the fire was not so bad in front as it was at the rear of the building, as the records and documents of the executive department of the company have thus been preserved. Many, in fact nearly all, the books and papers are damaged by fire, but very few are so damaged that they cannot be dried or copied.

Efficient Electric Lighting.

Striking testimony to the efficiency and economy of electric lighting has recently been given by the operation of the plant in the *Tribune* building, this city. Mr. Henry Hall, in behalf of the *Tribune*, writes thus to the Consolidated Electric Light Company (using the Sawyer-Man system), after a trial of eight months:

The plant in this building consists of one 100-light machine, as many lamps as the dynamo will stand, and complete outfit of wiring—the wire, by the way, extending from the cellar and ground floors to the ninth and tenth stories. The lamps give an excellent and satisfactory light, and those in the ninth and tenth stories are as bright as those in the cellar and first story. Their durability is all that can be desired. The dynamo runs without heating, and in a general way the whole plant operates to our satisfaction. The saving in the cost of lighting, as compared with lighting by gas, has been remarkable. The plant has nearly paid for itself in actual number of feet of gas saved in the last eight months, and will soon have paid for itself completely.

Underground Wire Commissioners.—On the 6th inst., the three new Commissioners for New York, Messrs. Hess, Loew and Moss, were sworn in before Mayor Grace. The Brooklyn Commissioners are getting ready for work.

The Jablochkoff Battery.

The interest centring around primary batteries is considerable, and seems likely to continue unabated. The utmost ingenuity is exercised in the endeavor to produce new types and patterns, and almost every element and every chemical compound under the sun has been at some time or other pressed into the service of the inventor in order to effect the object in view. The results have certainly not up to the present been such as to give much cause for congratulation, even in cases where the task has been undertaken by those whose chemical and electrical knowledge would be likely to render success a probability.

Thus, in our issue of June 13, we gave an account of a battery devised by M. Jablochkoff. This battery, it will be remembered, comprises an oxidizable metal which forms the first electrode; then a plate formed of a slightly oxidizable metal, such as lead, or of a porous carbon capable of polarization, forming the second electrode; and lastly, another electrode formed of lamellæ, or tubes of very porous carbon immersed in air.

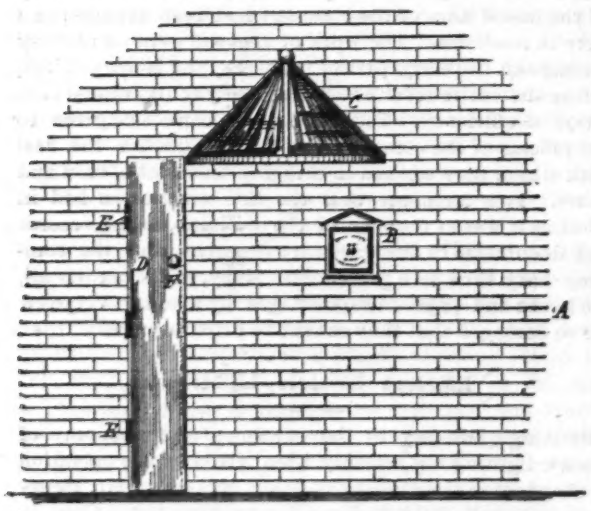
We remarked at the time that doubts were cast upon the alleged improvements embodied in this new form of battery, and our energetic contemporary, the London *Electrical Review*, which has been experimenting with this battery, states that as far as can be judged, the new element of M. Jablochkoff effects nothing which may not at least equally well be effected by many known forms of batteries.

In commenting further upon the battery it says:

"The battery is stated to be practically a hydrogen-oxygen couple, the hydrogen being generated by the local action of zinc or other metal in a carbon tray; it is stated, however, as a *curious fact*, that the electromotive force of the element is different with different metals. How this can be reconciled with the statement that hydrogen is the active element it is difficult to see. The "curious fact," in our opinion, is a plain proof that the action is due to the oxidation of the metal, as in any ordinary battery. We find it stated that a proof of the fact that the electromotive force of the battery is due to the hydrogen and not to the metal, is that "when a cell has been charged, the tray may be washed out to remove all the metal, the cell put together again, and after that it will be found that a powerful current is given off." With reference to this we would point out that the late Sir Charles Wheatstone found that the full electromotive force could be generated by a metal if but $\frac{1}{1000000}$th part of a grain were present. If a chemical test proved that the mere washing in question had absolutely removed every particle of the metal, there might be some ground for regarding the result as curious, but in the absence of such a test the statements can only be regarded as misleading."

Device for Preventing False Fire Alarms.

This invention might properly be called an automatic prison, as it is a device which may be employed with an ordinary alarm box, and which will compel the sender out



DEVICE TO PREVENT FALSE FIRE ALARMS.

of an alarm to remain by the box until the arrival of the person summoned by the alarm; the object being to prevent the sending of an alarm of fire by malicious or evil-disposed persons. When it is desired to send out an alarm, the sender stands close to the front of the box *B* and pulls the folding screen *D* around him until he can insert the key of the alarm box in the lock. As soon as he has turned the key he unlocks the box, from which he gives the signal in the usual manner, but the details are so arranged that he cannot liberate himself, and must wait until some one frees him by a suitable key.

It has been suggested that every one objects to being put in prison, and that the more pious the person the less likely would he be willing to submit. If, however, it should be officially introduced into our present alarm systems, it is reasonable to conclude that no one would object to shutting himself up for a few moments for a good cause, especially when doing so of his own free will. The design has been patented by Mr. Edward Jungerman of Gettysburg, Pa.

Arc-Lamp Tests at the Philadelphia Exhibition.

The reports of examiners of the Philadelphia Electrical Exhibition still continue to appear. The most recent is that on arc-lamps, which embodies a number of interesting facts.

The methods employed in testing the lamps will no doubt interest our readers, and we will therefore give a description of them. The examinations of arc lamps consisted mainly in measurements of illuminating power at various angles, from a horizontal plane to sixty degrees below, and in measurements of current and potential at the terminals of the lamp. No attempt was made to examine critically the regulating mechanism, or to measure the resistances of the regulating coils. The examinations were all conducted at the "test-house." Each lamp was supplied with current from the machine for which it was especially designed, and was adjusted and put in operation

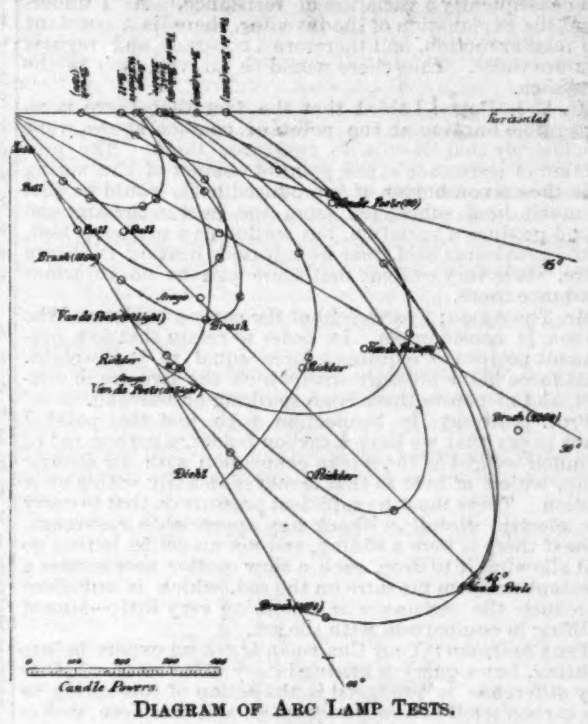


DIAGRAM OF ARC LAMP TESTS.

by the exhibitor, who also regulated the strength of the current.

Currents and potentials were measured by the same instruments employed in measurements of machines.

The standard to which all arc lights were referred was an Argand burner and "Methven's screen," loaned to the committee by Mr. Wright, of Weston's laboratory, which was accompanied by a certificate from the maker to its exactness as a two-candle standard. (The Methven burner was described in our issue of May 23 in the article entitled "Photometrical Measurement of Incandescent Lamps.")

It was tested against two standard candles and found to give the same light and to be much more uniform. This standard was placed at one end of a photometer bar of 450 cm. in length, at the other end of which was a 50-candle Swan lamp, serving as a secondary standard. This lamp was fed by a Brush storage battery, furnished and kept charged through the kindness of the representatives of the Brush company. A second photometer bar making a small angle with the first extended from this lamp into an adjoining room, where the arc lamp under test was suspended.

To permit of measurements of the light emitted from the arc lamp at various angles with the horizontal, the lamp was suspended from the end of an arm which was free to rotate about a horizontal axis parallel to the photometer bar, but vertically above it at such a height that when the arm was in a horizontal position the lamp could be suspended from its extremity with the arc on a level with the centre of the photometric disc. By this arrangement, when the end of the arm was raised the luminous point described a vertical circle whose axis was a line through the centre of the photometer disc and parallel to the bar. The radius of this circle was 127 cm. and the distance of its plane from the secondary standard 640 cm. At the centre of this circle was placed a mirror of glass, silvered on the back, at such an angle that the light from the arc lamp falling upon it was reflected along the axis of the circle upon the photometer disc. It will be seen that the distance between the lamp and mirror was thus rendered constant for all elevations of the lamp, that when the mirror was adjusted to reflect the light upon the disc the angles of incidence and reflection were always 45°, and that the distance from the image of the lamp to the secondary standard was always 767 cm. The mirror was carefully tested for absorption and the proper corrections made in the computation of the result.

The general plan of making observations was as follows: The arm from which the lamps were suspended was made horizontal and the height of the lamp adjusted to bring the luminous point on a level with the centre of the mirror and photometer disc. Two observers then adjusted and read the positions of the two discs ten times. The lamp was then raised by raising the end of the arm to which it was suspended and the readings repeated. This was continued until a sufficient number of positions had been taken.

Observations for current strength and for difference of potential between the binding posts of the lamp were made at frequent intervals while the photometric readings were in progress.

To facilitate the comparison of the arc lights with the standard, an apparatus was devised by which one-half or any larger fraction of the light could be cut off at pleasure. This apparatus consisted of a brass disc, about 30 cm. in diameter, having twenty-four sector-shaped openings, all equal to each other and to the metal portions that remained between. Upon this was placed another exactly similar disc, which could be so turned as to close any desired fraction of the openings.

The apparatus was mounted on a spindle placed parallel to the photometer bar, and in such a position that the light from the arc lamp must pass through the openings to reach the photometer disc. When the apparatus was made to revolve at only a moderate rate of speed it was impossible to detect the slightest flicker or inequality in the light in consequence of its use.

In the tests made by the committee, the apparatus was used, when used at all, with the sectors full open, when it was assumed to cut off one-half the light as theory would indicate. Experiment showed that if there is any error in this assumption it is far less than those arising from the unsteadiness of arc lights.

The accompanying diagram represents graphically the intensities of the various lamps and the distribution of the light below a horizontal plane. By applying the scale attached to any of the polar ordinates the intensity of any light can be read off for that position.

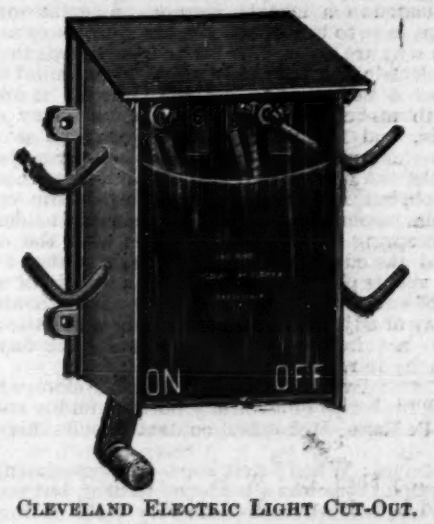
An inspection of the curves show the manifest advantage of placing arc lamps at an elevation, as their greatest intensity is at an angle of 30 to 45 degrees below the horizon.

New Electric Light Cut-Out.

The value of a good cut-out on lighting circuits is well recognized, and the need has given rise to various forms. Our illustration represents Cleveland's new cut-out, made by the Forest City Electric Works, of Cleveland, O.

The apparatus is so designed as to make and break connection very quickly, in fact its construction is such that a slow movement is impossible. This avoids undue sparking and the forming of the arc in the switch, and as the lamps are placed in circuit before the main circuit is broken, and *vice versa*, the sparking is reduced to a minimum. The lamp circuit when cut *off* is entirely disconnected from the main line.

The apparatus is simple in construction and the contacts remain perfect and are cleaned by each movement of the lever. The latter placed at the bottom operates the switches in the box, and the correct position is indicated by the



CLEVELAND ELECTRIC LIGHT CUT-OUT.

words "on" and "off." The whole is inclosed within a case, the back and top of which are of iron and the sides of black walnut.

Incandescent Lamps as Artificial Resistance.

To the Editor of The Electrical World:

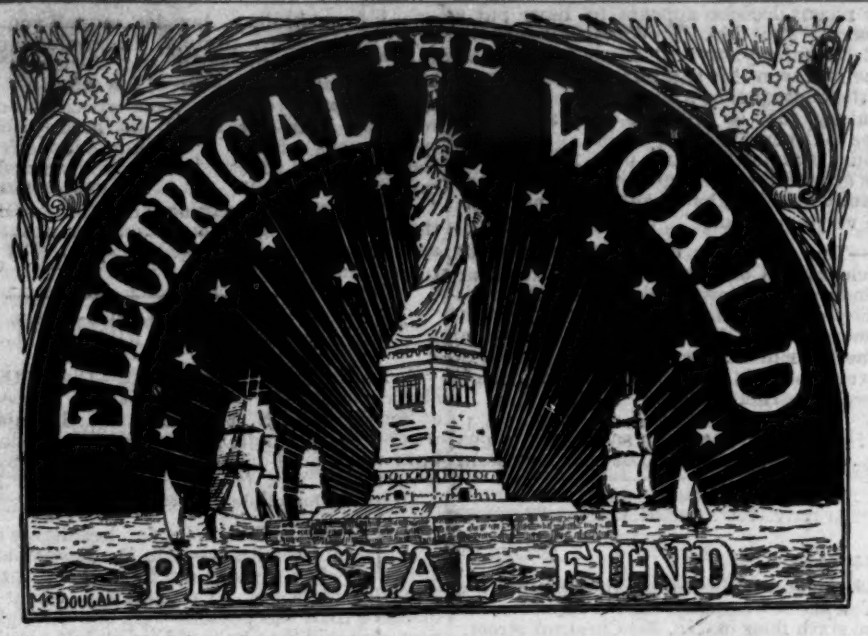
SIR: It may be of benefit to some readers of your paper engaged in the electrical business or experimenting to know that incandescent lamps will furnish them with an artificial resistance equal or preferable to a costly rheostat.

With proper connections and plugs as switches, so that they can be connected either singly or in series or parallel, any number of ohms can be arranged. They are especially to be recommended where sparks, caused by interruption of a current or induced currents, are objectionable, as, for instance, with electric clocks, etc., where they can be connected in a shunt with each secondary clock in the circuit. Or they can be connected in a shunt with a battery that does not require to be left open or closed for any length of time.

Small lamps of low resistance can be placed in a working circuit, showing by lighting up at any time a cross connection or short-circuit. I have been employing them for a number of years, and never heard of making use of them for such a purpose, and I thought it might be worth a little space in your paper. LEO BOCK, Jr.

NEW YORK, June 24.

The people of the Republic of France have presented the people of the United States with the Bartholdi Statue of Liberty, in commemoration of the first century of American national independence. It is the grandest and most magnificent gift ever made by one country to another. The cost, $250,000, was raised by popular subscription, and it is now proposed to defray the cost of the Pedestal in the same way. The *New York World* has undertaken to raise the $100,000 necessary to complete the Pedestal, and has already received about $50,000 from more than 50,000 persons.



The Statue, which will arrive here in June, is to stand on Bedloe's Island, New York Harbor, will be illuminated nightly by the electric light, and will thus serve to exemplify the triumph of the latest development of electricity, as well as the friendship of two great Republics The movement is one, therefore, in which all interested in electrical pursuits and industries should be proud to take part. All subscriptions entered on this blank will be acknowledged in THE ELECTRICAL WORLD and paid over to the *New York World*.

	Ft.	In.
Height of bottom of foundation-mass above mean low water,	13	00
Height of foundation-mass,	52	10
Height of pedestal,	89	00
Height of top of torch above top of pedestal,	151	01
Height of top of torch above mean low water,	305	11

"The Electrical World" Bartholdi Pedestal Fund.

We give below another list of contributors to our fund for the erection of the Bartholdi Statue Pedestal. It will be seen that the appeal to those engaged in electrical industries and pursuits has by no means been fruitless. There now remains only about $9,000 to be raised of the $100,000 which the New York *World* set out to collect, and we ask our friends interested in the good work to send in their lists and collections without delay, so that they may encourage others to be liberal.

From the employés of the Lace Leather Tannery of Chas. A. Schieren & Co., 47 Ferry street, City, $9.25, as follows: Hugh Goodwin, $2; Edward Smith, Brooklyn Transfer Express Office, Wm. Marrin, $1 each; Geo. White, Edw. Duffy, Richard Hanson, Jas. Reynolds, Barnard Mahan, Wm. Keith, John Stadky, F. W. Hackett, 50 cents each; John Leonard, 25 cents.

Through C. K. Miller, Barree Forge, Pa., $1.30, as follows: Mrs. M. S. Mumper, 25 cents; C. J. Geiger, 15 cents; J. W. Mumper, J. W. Geiger, H. A. Mumper, Mrs. J. W. Mumper, Clara Williams, Geo. Ford, Abraham Irwin, C. K. Miller, Mrs. C. K. Miller, 10 cents each.

Through S. H. Cowles, Buffalo, N. Y., $17 from Bell telephone employees. Through S. J. T. Brown, Hamilton, Ont., $1.

Through Mr. J. W. Lattig, Superintendent of the Telegraph Department of the Lehigh Valley Railroad Company, Mauch Chunk, Pa., as follows: S. S. Pursell, Perth Amboy, N. J.; Jno. M. Graham, Metuchen, N. J.; S. M. Field and J. H. Callahan, Three Bridges, N. J.; Robt. Storrs, Flemington, N. J., 50 cents each. J. H. Heany and S. C. Hulshizer, Bloomsbury, N. J.; Frank E. Snyder and F. Tobin, Phillipsburg, N. J.; J. H. Reich and Thomas Curran, Easton, Pa.; M. Garrity, South Easton, Pa.; F. G. Hughes, Glendon, Pa.; Wm. H. Crawford, Redington, Pa.; J. H. Riffer, Freemansburg, Pa.; H. E. Lynn, S. G. Clewell, M. J. Lennon and E. H. Schmick, Bethlehem, Pa.; T. J. Fretz, Fullerton, Pa.; James M. Lennon and Robt. Gillespie, Catasauqua, Pa.; J. D. Kaye, Hokendaugua, Pa.; M. J. Hartz and L. C. Bigley, Coplay, Pa.; F. B. Neff, Laury's, Pa.; E. C. Berlin, Cherry Ford, Pa.; W. H. Allen, Rock Dale, Pa.; O. B. Derr and L. S. Brown, Slatington, Pa., 25 cents each. H. C. Tropp, Lehighton, Pa., 50 cents. C. Walter, and J. L. Harleman, Packerton, Pa.; J. P. McGovern, Mauch Chunk Depot, Pa., 25 cents each.—$10.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, July 8, 1885.

Mr. E. M. Barton, vice-president of the Western Electric Company, has gone East for a three months' sojourn. His family accompanies him.

With the consolidation of the Western Electric Company's Boston shop with the New York factory, the Williams magneto will be brought to Chicago for manufacture. This will, I believe, bring all the licensed magneto bells to Chicago to be manufactured, except the Post bell, which is manufactured by the Standard Electrical Works at Cincinnati.

Mr. F. H. Angell, of the American Electrical Works, Providence, R. I., was a caller at this office last week.

Mr. A. F. Stanley, of the Western Electric Company, left for a trip through the South on July 6.

The Electrical Supply Company are fitting up a fishing boat, owned by O. W. Richardson, of Geneva, Wis., with a complete electric outfit. The boat will be driven by an electric motor, 16 cells of battery being employed, and lighted by incandescent lamps, one of which is so arranged as to allow of its being lowered into the water for fishing purposes.

A Chicago inventor is said to be working upon a new scheme, promising, if successful, to be a blessing of inestimable value to city residents who like to keep a horse but who do not like the odor thereof. This scheme consists of a feed trough and stall so arranged that by pressing an electric button upon the back porch of his residence the horse owner can feed or water his animal in the barn, by two touches brush him off nicely, and three touches put the harness on him and back him into the carriage shaft. If this proves a success, the inventor of the automatic stock salter and like inventions will shed tears of envy.

A proposition has been made to one of our street-car companies to run a certain number of its cars by electricity, the whole cost of equipping and running the cars to be borne by the proposer, the car company being asked to provide the conduit only. The idea is to successfully demonstrate the feasibility of the electric system.

Two weeks ago, an ordinance passed both branches of the Indianapolis City Council granting the Jenney Electric Company the same rights in that city as the Brush people enjoy. Since this time electric lighting has taken quite a boom. The Jenney people have erected a tower 130 feet high across the river in West Indianapolis, at the crossing of Kentucky avenue and Morris street, which will be ready for use as soon as the necessary wires can be run and connections made with the dynamo at Nordyke & Marmon's establishment, a short distance away. There are to be six lights of 2,000 candle-power each. The Brush folks have decided to erect five towers in the central part of the city—one in centre of Circle Park, one each on the corner of Illinois and Washington streets, corner Pennsylvania and Washington, Ohio and Pennsylvania, and Ohio and Illinois streets. The tower in Circle Park is to be 125 feet high and the others are to be 90 feet high, each to carry four lights. The Circle tower is now about 60 feet high; two others, corner Washington and Pennsylvania streets and corner Illinois and Washington, have foundations laid only. The afternoon of July 2 work was ordered stopped on all the towers by the city authorities, the City Attorney deciding that it was contrary to an old ordinance. The courts will probably have to decide the question.

It is to be hoped that Indianapolis will not try and distinguish itself in the line of Chicago by endeavoring to throw as many obstacles as possible in the way of the electric lighting companies. It is quite fitting, of course, and to be expected, that a town like Indianapolis should imitate Chicago in many things, but in this particular thing it should profit by Chicago's experience rather than follow in its footsteps, unless it wishes to give electric lighting a set-back from which it will not recover in a long time. Chicago has at last seen the error of its ways in this particular, and has an arrangement which promises to be comparatively satisfactory; and if the Indianapolis city fathers are wise they will commence where Chicago is now, rather than go over the same tedious course for themselves.

The Central Union Telephone Company has now come out fully against the new telephone law in Indiana, limiting rentals to three dollars a month.

It will be remembered that the telephone company gave their subscribers the necessary thirty days' notice, the latter part of May, terminating existing contracts July 1, the time the new law went into effect.

The company has sent out circulars to its subscribers notifying them that the law will be conformed to, so far as the telephones are concerned, but that additional charges will be made for lines, etc.

A new contract has been issued which old subscribers have been asked to sign. The clause which appears to be causing the trouble is as follows:

"Rental of one magneto-telephone and one transmitter (two telephones) at the rate of $20 per annum. Labor and service charges for switching, construction and maintenance charges for lines, batteries, central office apparatus, magnetic bell and other appurtenances at the rate of $40 per year."

The vital part of the new law, as heretofore published in THE ELECTRICAL WORLD, is as follows: "Be it enacted by the General Assembly of the State of Indiana that hereafter no individual, corporation or company operating in the State of Indiana shall be allowed to charge, collect or receive as rental for the use of such telephones a sum exceeding $3 per month, where one telephone only is rented by one individual, company or corporation." It is also provided that where two telephones are rented by the same party the charge shall not be more than $2.50 per month for each, and that the charge for talking between villages or cities shall be not more than 15 cents for the first five minutes and 5 cents for each additional five minutes.

The new contract is for three months only.

A meeting was held at the Board of Trade, Indianapolis, July 1, at which a committee of 5 business men was appointed to investigate the new law and act for subscribers. It is to be hoped that the committee and telephone people will come to an understanding soon.

On account of the notice from the city authorities to stop work on towers, the Brush company have stopped work on those in the streets. The one in Circle Park was raised to its full height, however, and is now ready for lights.

Following the Chicago plan the city caused the arrest of several of the Brush company's workmen for digging in the streets without permission from the proper authorities, and they will have their trial soon.

On the afternoon of June 30, in West Indianapolis, James Hollander, on a trifling wager, climbed to the top of an electric light tower, 120 feet high. He attempted to descend by means of a guy rope, but his grip on the rope was lax and he descended at such speed that the friction caused him to relax his grasp, when he fell to the ground, seventy feet. In falling his body struck some telephone wires, turning him head downward, and he fell on his head and shoulders. His injuries are fatal.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, July 9, 1885.

Among the attractions at the Point of Pines, on the north shore near this city, is the electrical railway. This enterprise is on the Daft principle, as exhibited at the New Orleans Exposition.

The dining room, office, halls and piazzas of the Ocean House, at Newport, R. I., were lighted at its opening, June 24th, by the 125 candle-power lamps of the Weston system. The comfort of the guests will be much enhanced this season by this improvement. The New England Weston Electric Light Company placed its lamps at the Ocean House at very short notice, to the satisfaction of the proprietors. This company has already a very large business in Newport and an increasing demand for its lights. It is now running in that city one hundred of the large and two hundred of the small 16 candle-power incandescent lamps.

The Domestic Electric Manufacturing Company, 17 Congress street, this city, has received several very large orders from the West and South for its electric gas-lighters. This company is contemplating the establishment of several Southern and Western Agencies at an early day.

The Mayor of Boston has ascertained, in looking over expenditures under his power conferred by the new charter, that this city is paying $10,000 a year for the use of telephones.

Messrs. Taft & Westervelt, who recently opened an office at No. 28 Pemberton square in the interest of the Schuyler Electric Light Company, report business as being already very satisfactory with them.

The students taking the course of electrical engineering in the class of '85 of the Institute of Technology have just finished a very elaborate and careful series of experiments in regard to the efficiency of all the well-known electrical motors. The Daft, Stockwell and Sprague motors gave exceptionally good results.

Mr. H. C. Spalding, of Boston, has hired one of the largest buildings belonging to the Atlantic Works, and is putting in a large amount of machinery for insulating wire and for making cables of various sizes and styles.

Mr. Percival D. Richards, formerly treasurer of the Merchants' Electric Light and Power Company, has recently invented a very novel and simple piece of mechanism, whereby, through certain applications of electricity, the deviation of a ship from her regular course is instantly and automatically made known by means of an alarm; and if necessary, the amount of such variation is recorded. A number of prominent Boston gentlemen are interested in it.

A syndicate of Boston and New York gentlemen, viz.: Hon. Selwin Z. Bowman, Boston; G. W. Turner, Manager New York *World*, New York, and Fred. M. Kimball, Assistant General Manager of the Electrical Development Company, Boston, are pushing the manufacture of a very novel and ingenious mechanism—an electric clock. It is a Russian patent, but is controlled throughout America by the above syndicate. Its action is simple and little liable to get out of order, and its working is so arranged that it is actuated for from four to six months without any attention whatever. At the end of that time ten minutes' work places the clock in condition to run for another period of from four to six months. It is a perfect time keeper, and consists of only a very few parts of the most simple construction. It has every appearance of being in the fullest sense of the word "a good thing."

I had an interesting conversation this week with a prominent officer of the Thomson-Houston International Electric Company, of which Mr. C. A. Coffin is President; Mr. H. A. Pevear, Vice-President; Mr. J. N. Smith, Treasurer, and Mr. Whitney, Secretary. My interlocutor said: "At the London Exhibition the company has a large plant, which is exciting very favorable criticism and comment. In a letter from the London representative, just received, speaking of a visit paid by the Jury on Electrical Appliances, he states that during the lists which were made lamps were cut out 25 and 30 at a time; machines were short-circuited, oil was poured on the commutators, and in fact everything was done that could possibly try the dynamos or lamps; but the only result was to demonstrate the perfectly automatic features of the machines and the entire freedom which existed from any liability to injury from short-circuiting. During the time which the apparatus has been on exhibition, the plant has been run without any extra parts, even so much as an extra commutator or lamp, being held in reserve in case of accident. While this was a very risky thing to do, there has been no interruption from any cause since the lights were started up, except on one occasion, when the engines were shut down for about eight minutes, when, of course, the machines were idle that length of time. The company has within the past few months installed a large number of arc lights in different cities in South America and Europe, and the indications are that the great success which has followed the efforts of the parent company in this country during the past three years, in which time they have lighted up nearly 100 cities and towns, will attend the efforts of the new company abroad. The company aims at furnishing an economical and thoroughly commercial system of arc and incandescent lighting, the intention being to furnish a steady, uniform and economical light, supplied by apparatus so constructed that the depreciation from wear and tear is reduced to a mere minimum, and the cost in production of light brought down to a very low basis."

An enterprising and highly important movement is being made in this city, and is at present under consideration, to

transmit by the Daft system the energy of a large water power into Boston from a point one hundred miles distant.

The large music hall of this city has been supplied with a compelete outfit of 125 candle-power incandescent lamps of the Weston system.

The electrical railway at the Point of Pines, near Boston, has at present about three-quarters of a mile of track —from a hotel to the pier—but at an early day it will be extended to 3½ to 4 miles. Mr. H. McL. Harding, manager Massachusetts Electric Power Company, is the gentleman who has attended personally to the starting and the pushing forward of this enterprise, and his efforts have been crowned with success. The railway is running easily and without any hitch, and is well patronized by the visitors to Point of Pines. The same apparatus was used at the New Orleans Exposition, and ran 5½ months at an average of 8½ hours each day without any breakdowns or mishaps, and never lost a single day during that time.

Mr. H. E. Judkins, Manager of the Judkins Railway Train Signal Company, returned to this city from New York last Tuesday, having been busily engaged during the past fortnight equipping a train of the New York, Lake Erie & Western R. R. with the electric train signal, owned and controlled by his company. The adjusting of this signal to the train as stated, is to practically demonstrate to railway officials its simplicity, usefulness and durability.

The Boston Electric Company, 550 Washington street, has perfected a patent electric door-lock for apartment houses, doctors' offices, etc. The principle of this novel and useful contrivance is the action between the door-knob and a push-button at any distant point, the former being controlled by the latter. The action is simply the throwing into gear the knob and the bolt by action of a current through an electro-magnet.

THE TELEGRAPH.

Philadelphia Fire Alarms.—A new fire alarm system has been devised by Mr. D. R. Walker, Chief of the City Electrical Department, for the Fire Department. It gives telephonic connection between the engine houses, the main office and the electrical department at Fifth and Chestnut streets. It is in addition to, but independent of the old system, and requires 70 miles of wire divided into eleven circuits.

Underground Wires for Washington.—Mr. D. H Bates, President of the Baltimore & Ohio Telegraph Company, signed a contract with the Averell Insulating Conduit Company for placing the wires of the Company underground. The work will be begun in Washington immediately. The insulating material in which the naked wires are laid is composed of pure silica and refined asphaltic cement. From experiments already made it has appeared that 1600 wires can be laid to the square foot, the insulation being good.

To Pay a Pole Tax.—In the case of the City of New Orleans against the Western Union Telegraph Company to recover $3,060 on an ordinance which provides that no poles for the purpose or use of supporting wires for telegraph purposes shall be allowed to be erected, etc., in that portion of the city bounded by Jackson street and the Elysian Fields and Roman street and the Mississippi River except upon payment of $5 per annum for each pole, a decision has been rendered by Judge Boarman, in the United States Court, sustaining the petition and allowing judgment to the full amount against the telegraph company.

THE TELEPHONE.

The Intercontinental.—The Intercontinental Telephone Company is in receipt of its regular monthly remittance from Caracas, the eighth since January 1st, 1885. The receipts for May were $3,711.55, and the expenses $1,371.36, a net profit of $2,340.19 for the month from its four exchanges and trunk lines in Venezuela.

The Tropical American Company.—The annual meeting of the stockholders of the Tropical American Telephone Company, Limited, for the election of directors, etc., will be held at Long Branch, N. J., on Wednesday, the 29th of July, at 12 o'clock noon, at the office of the Transfer Agent, 312 Broadway. The dividend of the Tropical American Telephone Company is payable at the company's office, 95 Milk street, Boston, on and after July 15th.

Telephone Works Shut Down.—A dispatch of July 20 from Montreal says: The employés of the Dominion Telephone Company have put in seizures on the company to receive their pay, and the works here have in consequence shut down. The capital of the company is $200,000, of which half was, it is alleged, subscribed, and the company claims 50 miles of wire in operation. The seizures amount to about $1,500, and there is about $10,000 worth of machinery and stock in the works.

The Lowell Syndicate's Reply.—On July 1 the answer of the defendants in the suit of Messrs. Bennett, Sherman and Tibbetts against Wm. A. Ingham, Charles J. Glidden, Loren N. Downs, Wm. H. Bent and A. A. Coburn, members of the "Lowell telephone syndicate," was filed in court at Cambridge, Mass., by their counsel, D. S. & G. F. Richardson. After the usual preliminaries, the answer reads as follows: "And now come the defendants in the above-entitled action and deny each and every allegation in the plaintiff's writ and declaration contained in each and every count thereof." The case was entered at the June term, and will be tried in September.

The Pittsburgh Suits.—Speaking of the suit of the Bell Company against the Western Pennsylvania Telephone Company, Mr. Metzger, of the local Bell company, says: "I do not think it possible that the Western Company can win. The points they set up in their defense have all been decided in favor of the Bell Company in various cases. Their defense was exactly the same as that of the Molecular Telephone Company before Judge Wallace, of the United States Court of New York. It is said that the Western Company felt sure that Judge Wallace would refuse to grant an injunction against the Molecular Company, and for that reason based their defense on that of the Molecular Company."

The Molecular in Salt Lake City.—The Molecular people had been endeavoring to introduce their system into Utah, but the recent decision appears to have put a check on their work. Mr. Geo. Y. Wallace, one of the directors of the Bell company, says: "Some people have supposed that if the Bell won this suit an immediate jump in rates would be the consequence; but it will not be so. We shall move along just as we have done, and try to make the service as indispensable as possible. The telephone now in a house is almost as much of a necessity as a newspaper. We are making arrangements for extending the lines to Sandy and Bingham, and shall have exchanges there in a very short time."

New England.—The statement of the New England Telephone and Telegraph Company for April and four months of the calendar year follows, and shows continuous pursuit of the policy which it is hoped will bring dividends within a few months. The average construction expenditures for the four months were $8,000. Their expenses for April were about $4,600. Dividends will come in part from reduced construction.

	April.	Since Jan. 1.
Gross earnings	$77,771.86	$307,394.95
Expenses	54,513.62	212,848.12
Net earnings	$24,258.24	$94,546.83
Construction	4,591.47	32,045.22
Surplus	$19,666.77	$62,501.61

A Sale of Effects.—A constable's sale of the effects of the Clay Commercial Telephone Company, used in the operation of the office on the sixth floor of No. 302 Chestnut street, Philadelphia, was held July 6. The sale is to raise money for rent, amounting to $333.35, which has been due and unpaid by the company. Superintendent F. W. Smith says that the company is in a good position financially, owing not more than $5,000 in the city, but that the directors, in view of the uncertainty of affairs pending the decision of the court in the suit brought by the Bell Company for alleged infringement of patents, were unwilling to put more money in the concern. The instruments and attachments sold were worth, according to Mr. Smith's estimate, nearly $10,000 to the company; but as they could not be used, owing to the court's restraint, until a decision is rendered, their value now is greatly lowered.

Must Be Impartial.—At Louisville, Ky., in the suit of the Baltimore & Ohio Telegraph Company against the Ohio Valley Telephone Company, which was recently instituted to compel the defendant to grant the same telegraph connections to the Baltimore & Ohio Company as were granted to the Western Union Company, the Chancellor has made absolute a rule against the defendent for contempt of mandatory injunction, the purport of the Chancellor's decision being such as to compel impartial telephone facilities to the Baltimore & Ohio Company. The opinion holds that no contract between the Bell Telephone Company and the Western Union Telegraph Company can absolve the Bell Company's licensees, the Ohio Valley Telegraph Company, from the exact duty of serving all the public and all applicants without discrimination.

The Fight in Pennsylvania.—The injunction case of the Bell Telephone Company against the Western Pennsylvania Telephone Company, using the Randall apparatus, for infringement of patents, is being tried this week in the United States Circuit Court at Pittsburgh. The array of talent on both sides is most formidable, and a sharp contest is going on. Among those representing the Bell Company are E. N. Dickerson, of New York; J. J. Storrow and Roberts Brothers of Boston, and James I. Kay, of Pittsburgh. For the defense there are Briesen & Steele, of New York; Bakewell & Kerr and J. H. Christy, of Pittsburgh, with E. H. Farrar and J. R. Beckwith of New Orleans, as associate counsel. Among the others who are present to hear the case tried are W. Vanbenthuysen, President of the National Improved Telephone Company, from which the defendant company in this case gets a license; P. O. Fazenda, banker, of New Orleans, and Charles P. Huntingdon.

An Appeal to Cæsar.—It is reported that the Molecular Telephone Company will appeal to the Supreme Court against Judge Wallace's recent decision, reported in this column on June 27. The *Journal of Commerce* of this city makes a sharp attack on Judge Wallace for his decision. It says: "The record of the suit, now for the first time before us *in extenso*, enables us to take the Molecular Company entirely out of the list of defendants who seem willing to give away their case. The pretensions of the Bell patentees are met at every point, and the priority of other inventions not merely for the transmission of sounds and musical tones, but articulate speech, is supported by a large amount of testimony." It adds: "The existence of such testimony as this, and much more which we have not space to indicate, affords the public still room for hope that the burdensome yoke of the Bell monopoly may yet be broken by an appellate tribunal with all the facts before it. Judge Wallace's lapse of memory, and perhaps also his indifferent reputation as a jurist, deprive his decision, like those previously gained by the unnecessary admissions of defendants, of the weight necessary to constitute a final settlement of a case which concerns not merely the litigants, but a large part of the business community."

Reducing Salary by Telephone.—A Paris tenor singer of repute and an electrical friend visited the recent electrical exhibition at the Observatory, and inspected the telephone. The tenor wished to talk with his manager. The friend busied himself about the apparatus, "to establish the connection," as he said, and then retired, not wishing to hear the conversation. But as a matter of fact he entered a private cabinet with which he had connected the wires. "Can I have a word with you, Monsieur le Directeur?" inquired the tenor. "Certainly," answered a distant voice. "It gives me such pleasure that I am able to converse with you at this distance. What's the news?" The voice replied, "That you are fast losing your voice and have lately been singing dreadfully out of tune. You are no longer a tenor, but a veritable hurdy-gurdy!" "I must have misunderstood you," observed the singer in the greatest alarm. But the extraordinary statement was repeated, with the addition: "You will plainly see that I cannot go on paying you the same salary. If you are willing to stay on for half——" The tenor, flushed and excited, ran out of his cell and down the steps, and called for a cab to take him to the address of his manager. He did not stop to say good-by to his friend, who stood watching him and laughing aloud. A few minutes later the tenor stood before the manager. "I am willing to stay for two-thirds of my former salary, but let me tell you one thing—my voice isn't a hurdy-gurdy. You understand?" "To be sure," said the manager, who thought this member of his company had gone out of his mind. "You know how greatly I prize your voice, and especially now that you are reducing your claims. I am greatly obliged for your spontaneous offer." "Spontaneous offer?" exclaimed the bewildered artist; "when you wanted to cut down my salary by half * * * through the telephone! That confounded invention. * * *" The manager saw that a trick had been played on the unsuspecting tenor, and is said to have declined acceptance of the proffered reduction.

THE ELECTRIC LIGHT.

A Large Remington Light.—One of the largest single electric lights ever constructed was placed on exhibition at Seneca Falls, N. Y., on a recent Saturday evening. It was of 50,000-candle power, and was made in Ilion. The light was placed on the tower of a building at a height of seventy-five feet from the ground. It is intended to illuminate the whole village.

Headlights.—Electricity for headlights on locomotives was tried for the first time in the East on an engine of the Lehigh Valley road, that left Jersey City for Easton on Saturday night last. The light was seen at a much greater distance than was possible with the oil light. The engineer also said that he could see plainly a mile ahead of him on the track. The farthest he could see with the oil light in front of him was 136 feet. The electric light, he said, burned steadily and didn't flicker, as oil lights often did. He declared that electricity for headlights was far more satisfactory than oil.

Lowell, Mass.—There are now 246 lights in operation, including street lights, stores and places of amusement. Four were added this week in Mitchell's Bijou shoe store, which increased the whole number to 250. By the recent additions the Middlesex Company will be obliged to run its dynamos to their full capacity. Nine incandescent lights are now in operation as an experiment at the electric light station in Middle street. Good satisfaction is given, a steady light being obtained. It is the intention of the company to introduce incandescent lights into houses and places of business as soon as further experiments are made.

Praise Begrudged.—There are no lights used to the best advantage on the streets of Cleveland, except those on the mast in the Public Square. It does good service, but the other masts and the pale lights on Euclid avenue are so placed that more of the light is wasted in dense shadows than is utilized. The best system of hanging electric lights in streets is that of arches across the thoroughfares, with the lamps suspended in the centre. Still, the light costs too much, and any economic inventions that may have been made are of no benefit to the public. It is not allowed to share them. But the lights grow in brilliancy and steadiness.—*Cleveland Plain Dealer.*

Relative Values of Lamp-Shades.—Too little attention is paid to the degree in which lamp shades serve to obstruct light or to increase illumination at certain points. The subject has, however, been taken up by Prof. H. L. Cohn, in Germany, who has recently described a long series of determinations of the relative values of various forms of lamp-shades. The method pursued was to measure the brightness of white paper lying on a table over which the source of artificial light was suspended at a given distance, by means of a Weber photometer. As one would anticipate, the general effect of a shade is to increase very greatly the illumination immediately under the light, and not modify it notably at an angular distance greater than forty-five degrees from this region. Taking as a measure of the value of the illumination the number of lines which can be read from a newspaper in a minute, and as the unit of illumination that of a normal candle at a perpendicular distance of a metre from the paper, he finds that the best illumination is not less than fifty such units. Since even a fifth of this illumination is very rarely secured, except immediately under a lamp provided with a good shade, he emphasizes the conclusion that few school children work in a satisfactory light. Children are not the only sufferers.

It Would Not be Blown Out.—Mr. Royal Wilson, a colored gentleman who has just been called to the position of head-waiter at the Armijo House because of the illness of the head-waiter proper, made a brilliant break night before last. The dining-room of the hotel is illuminated at night by an electric light, and when Mr. Wilson thought that the proper time had come to extinguish the light after supper was over, and there was no further occasion to keep up the illumination, he concluded to put it out. Mr. Wilson was the only man in Albuquerque who didn't know that an electric light could only be extinguished by turning a crank. He was in a state of painful uncertainty as to the proper mode, but finally made up his mind that the simplest way out of a difficulty is always the best. He placed a table under the light and a chair on the top of the table, and mounting the latter he blew and blew and blew at that electric light with all the force of his lungs, but it only winked at him in an aggravating sort of way and invited him to keep up his lick. He did keep it up until his eyes bulged and the sweat trickled in rivulets from his features. When he was in a state of utter exhaustion he gave up the job in disgust and said that light might burn all night if it wanted to.—*Albuquerque Journal.*

MISCELLANEOUS NOTES.

Electrical Warfare.—The balloon detachment of the German army have invented a balloon with electric light and telephone attachments, and capable of carrying four persons. The light is sufficiently strong to make the ground perfectly discernible for a distance of more than a mile.

How to Catch Mormons.—A prominent Mormon named Jenks, whose friends have said that he was not in Salt Lake City, but for whom the authorities have kept an anxious lookout, was caught recently in a clever way. A Gentile business man, who had occasion to use Jenks telephone one day, noticed that the connection was wrong, and before he could get it righted he found that Jenks was talking, and that he supposed he was telling another Saint where to find him. The Gentile listened long enough

to get the address, and, putting it in the hands of a deputy marshal, Jenks was nabbed before he had a chance to wonder if his friend was coming. It is little things like this which make the Saints hate the Gentiles.

Compressed Steel Magnets.—The French Société d'Encouragement has, in consequence of a favorable report by M. Carnot, awarded a platinum medal to M. Clemandot for his steel magnets, compressed to the extent of 15 per cent. of their original volume, and capable of sustaining twenty times their own weight, while retaining their magnetization to a remarkable degree. The magnets are made of Allevard steel, by M. A. Piat, of Paris.

Detection of Icebergs in Fog.—Some recent experiments show that echoes may be plainly heard at sea, even when the object sending back the sound is a mile away from the source of the sound. It is suggested therefore that icebergs might be detected at sea and avoided if shots were fired periodically from the bow of a steamer or other vessel. Mr. Della Torre, who originated this method, claims that a steam-whistle or siren, combined with a projecting apparatus like a speaking-tube, will serve as efficiently as a gun. Prof. A. G. Bell has taken great interest in the method, and has conducted the experiments establishing its feasibility.

In Memory of Prof. Henry.—One of the most notable incidents of commencement week at Princeton College was the unveiling in Marquand Chapel of a tablet to the memory of Prof. Joseph Henry, who was a member of the faculty of the college from 1834 to 1848. The tablet has been presented to the college by a few friends, to commemorate his valuable services to science, and in particular his discoveries in electricity. It is the work of Mr. L. St. Gaudens, from designs by Mr. A. Paige Brown, artist and architect of this city. It is made of Echaillon marble. It is about six feet in height and four in breadth, and has in the centre a life-size likeness, which is highly spoken of for its fidelity. The speech of presentation was made by Mr. E. N. Dickerson, of New York, and was a masterly oratorical effort.

BUSINES NOTCES.

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washihgton streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in there possession show. This firm also demagnetize watches that are already affected.

Hale's Honey.—The great cough, throat and lung cure, 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals—beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 60, a 62; Am. District, b 20, a 26; B. & M., b ¼, a 1¼; Western Union, b 60⅛, a 60½.

Telephone.—Am. Bell, b 202, a 203; Erie, b 22, a 22½; Mexican, a 1; New England, b 33½, a 34; Tropical, b 1.

Electric Light.—No new quotations.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JUNE 23, 1885.

Circuit Closer; Judson E. Root, Westfield, N. Y.... 320,504

In operation, when the key is in use, the finger of the operator will depress the button, and the lever will raise the pin *C* clear of the anvil. On releasing the thumb-piece pressure will be removed from the button, and the gravity of the pin *C* will cause it to fall on the anvil, and so close the circuit with certainty when the instrument is not being used in sending. By the adjustments of the sections of the trip such parts may be set to give the lever, and consequently the pin, a greater or less throw, as may be desirable in different instruments.

Heat Regulating Device for Incubators; Jacob K. Meschter, Philadelphia, Pa..... 320,490

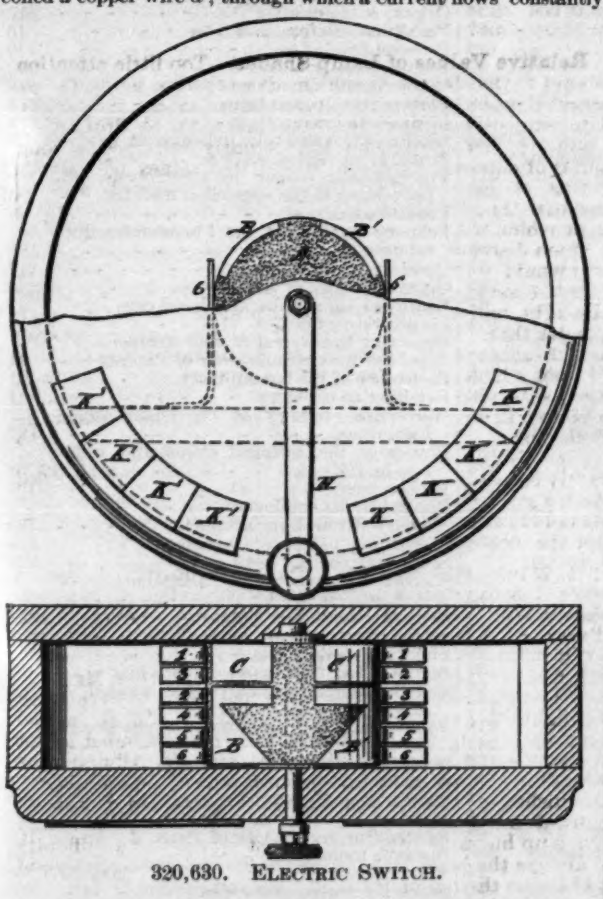
The inventor has a broad claim upon the combination of a hot-water-circulating boiler, a burner to heat said boiler, a valve to control the size of the flame from said burner, and a regulator, automatically operated by the varying changes in temperature of the atmosphere exterior to the incubator, to control said valve.

Train Signal; Marcus F. Parrish, and Schuyler J. Munn, Niles, Assignors of one-third to Horace P. Peck, Allegan, Mich..... 320,495

Improvement on their patent of April 22, 1884, No. 297,438, and embraces a friction plate swiveled upon a conducting arm for engaging a line of wire along the engine railroad track.

Electro-Magnetic Reciprocating Engine; Charles J. Van Depoele, Chicago, Ill..... 320,515

Within the tube *t* runs a plunger or core *p*, around which is coiled a copper wire *a'*, through which a current flows constantly



320,630. ELECTRIC SWITCH.

n the same direction, thus always magnetizing the plunger or core with the same polarity. One terminal of this coil is permanently connected with the iron plunger, while the other end is insulated from the same, and is connected to a sliding contact-piece *s*, traveling with the plunger *p*, and rubbing on a stationary contact-piece *S*, running the full length of the solenoid and insulated from the tube *t*.

Electrical Game-Indicator for Pool Tables; Elias Curtis, Kansas City, Mo..... 320,542

This invention consists in providing the table with a pendulous support for the triangle in such a manner that the weight of the triangle, when not in use and suspended from such support, serves to hold open an electrical circuit, and by the removal of the triangle from the said support the circuit is thereby automatically closed and the table is indicated to be in service.

Medical Battery; Otto Flemming, Philadelphia, Pa..... 320,547

Consists of two or more main batteries of a number of cells each, and conductors to couple up said batteries in series, in combination with commutators permanently secured to the framework of said cells to couple up the cells of each of said batteries either for quantity or intensity, whereby a current of the required degree of intensity and quantity may be obtained.

Electric Arc Lamp; Gustave Pfannkuche, Hartford, Conn., Assignor to the Schuyler Electric Light Co., of same place..... 320,585

A portion of the armature under one core is composed of brass, while the other end is made entirely of iron. Thus when a current is passed through the arc-branch the iron clutch-bar is first attracted at one end, thereby tilting it and causing it to mechanically grasp the carbon-carrier. When attracted to one core, the clutch-bar becomes more strongly magnetic, and its opposite end is attracted, thereby restoring the clutch-bar to a horizontal position at right angles to the carbon-holder and in an elevated position, but leaving said holder mechanically free to slide through the clutch-opening. At the juncture, however, when the carbon-holder is left mechanically free to slide through the clutch, it is firmly held by magnetic attraction between the iron clutch-bar and the iron carbon-holder as long as the current in the arc-branch is maintained.

Electric Lighting Device for Gas Burners; Leroy S. White, Waterbury, Conn..... 320,606

Comprises pendent devices provided with indicators, one of which is hollow, and receives through it one of the pendent devices.

Electric Lock; Charles Blattmann, New York, N. Y. 320,617

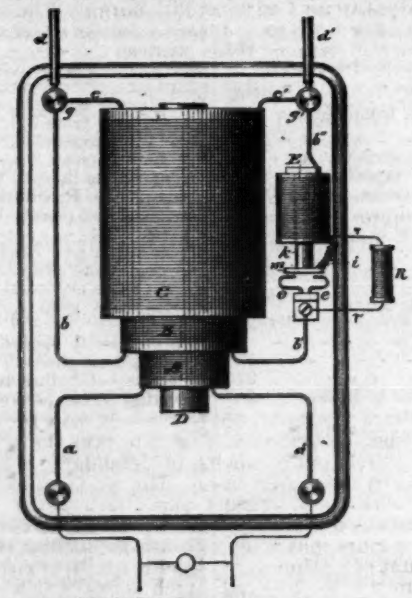
Consists in the arrangement of a revolving locking-plate in the staple-case of a door-lock, fastened by a suitable projection or stop to keep the locking-plate in its proper position, and in the arrangement of an electro-magnet in the staple-case, connected with the stop for said locking-plate, through which this stop is operated to relieve the same and allow the bolt of the lock to pass freely.

Electric Switch and Insulators for Tracks; Leo Daft, Greenville, N. J..320,630, 320,631, 320,632, 320,633

In the first *A* represents a cylinder, which is preferably of insulating material. The plates which are upon it should at any rate be insulated from each other. This cylinder has upon its surface four plates, the shapes of which are shown in Fig. 2.

C and *C'* are substantially rectangular plates before they are shaped to the cylinder, while triangles are cut out of the adjacent sides of the rectangular plates *B B'*.

Upon both sides of the cylinder-springs 1, 2, 3, 4, 5 and 6 are arranged, adapted to make connection with these plates. The



320,717. INDUCTION COIL.

springs shown in Fig. 2, and bearing similar numbers, are connected together, and these connected springs are connected with the brushes and field-magnet wires.

The remaining three patents show means for insulating each rail from the ground, consisting in inserting an insulating substance underneath each rail. In the third patent a third rail between the other two is employed to serve as a conductor.

Insulating Pipe Union; Charles H. Fisher, New York, N. Y., Assignor to the Archer & Pancoast Manufacturing Company, same place..... 320,645

A shell of insulating substance is inserted between the pipe sections.

Electrical Railway; William Painter, Baltimore, Md., Assignor of one-half to Lewis R. Keizer, of same place..... 320,679

As applied to surface roads the conductor is inclosed in some suitable insulating material and buried alongside of the track, and only appears at or above the surface by contact-points in electrical connection with the conductor, arranged at intervals and projecting upward from it to a short distance above the track and close thereto. The tops of these contact-points are exposed and attached to the car, and in electrical connection with the motor thereon. There is a suspended contact plate or blade, which successively makes connection with the projecting contact-points, the blade being of sufficient length to span the spaces between contiguous points, and thereby maintain electrical connection with the conductor as the car moves on the track.

Electric Bell; Henry B. Porter, Chicago, Ill..... 320,685

Consists of improvements upon his patents of April 15, 1879, No. 214,261, and July 18, 1882, No. 261,172. The improvement consists of a single helix secured to the frame by a yoke having attached thereto or formed integral therewith an upright post, to which the bell is secured.

Induction Coil; William Stanley, Jr., Pittsburgh, Pa. 320,717

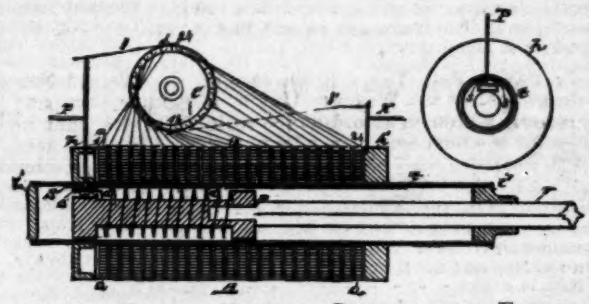
It is intended to be applied to a system of electrical distribution where there is a main circuit leading from a dynamo-electric machine or other source of electrical energy and local work-circuits containining translating devices; and the object of the device is to generate, by means of the current in the main circuit, induced currents in the work-circuits to operate the translating devices therein, said work-circuits not having electrical connection with the main circuit. The wires *a a'* at the end of the work-circuit nearest the main circuit form a coil *A* about an iron core *D*. Outside the winding *A* of the core *D* is wound a second coil of wire *B*, the extremities of which are connected with the mains *d d'* at the points *g g'*. Outside of the winding *B* is wound a third coil of wire *C*, the extremities of which are also connected with the mains *d d'* at the binding-screws *g g'*.

Incandescent Lamp; John A. Yunck, Sharon Hill, and John Stuertz, Philadelphia, Pa., Assignors to Henry C. Terry, trustee, Philadelphia, Pa..... 320,739

Consists of an incandescent lamp having its carbon mounted loosely on supporting-wires and provided with supporting-arms, and means attached to one of said supporting-arms for electrically connecting said supporting-arms, and one of said supporting-wires, the said arm and wire being normally insulated from each other.

Armature for Dynamo-Electric Machine; Alexander H. Bowman, Packerton, Pa..... 320,754

Inventor has broad claims upon an armature built up of bobbin sections formed of links. The links are held together by a single



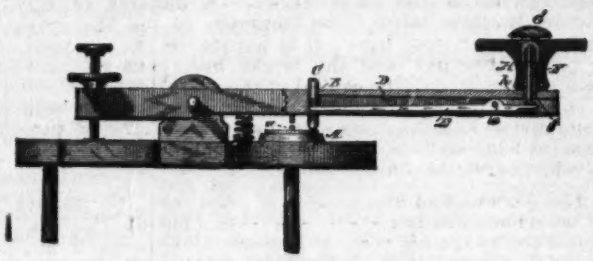
320,515. ELECTRO-MAGNETIC RECIPROCATING ENGINE.

bolt passing through the centre, and the sections are held together in the manner of the stones or bricks forming an arch in a bridge.

1. **Regulator for Dynamo-Electric Machine**... 320,840
2. **Electric Arc Lamp**..... 320,841
3. **Regulator for Dynamo-Electric Machines**... 320,842
4. **Electric Arc Lamp**; Charles L. Buckingham, New York, N. Y..... 320,843

1. Consists, first, of a dynamo machine, a regulator therefor for varying the strength of current in the working circuit, a motor capable of imparting rotation in either direction for controlling the regulator, and two electro-magnets placed in the working circuit, and adapted one to control rotation in one direction and the other to control rotation in the opposite direction; second, of a dynamo machine, a variable resistance-shunt around the field-magnets, a regulator for varying said shunt-resistance, and a motor operated or controlled by the working circuit capable of imparting rotation in either direction to said regulator.

2. The carbon-holder is held between rollers whose pressure is so adjusted that, when uninfluenced by either the lifting or feeding



32[illegible],504. CILCUIT CLOSER.

electro-magnet, said carbon-holder will be stationarily suspended between the rollers or any suitable friction-support.

3. Consists of the combination of a variable resistance in a shunt around the field-magnets of a dynamo-electric machine to vary its electro-motive force, an electric motor whose rotating armature is normally stationary, but which is capable of rotation in either direction for varying said shunt resistance, and two main-line relays, one of whose armature-levers normally rests on front stop and the other on a back stop, and adapted to cause rotation of said motor-armature in either direction upon an increase or decrease of main-line current.

4. Consists in the arrangement of suitable mechanism with a clutch adapted to separate the carbons of an electric lamp and to establish the arc; to next unclamp the carbon-holder, leaving said carbon-holder suspended by a train of wheels, and to then return to its normal position and remain in readiness to re-establish the arc to its normal length in case of over-feeding upon the release of the gear-train. To this end, preferably, an arc branch electro-magnet is employed to raise the clutch, while a shunt electro-magnet next operates to short circuit the arc branch electro-magnet upon the establishing of a normal arc, thereby permitting the clutch to return to its normal position, and a second shunt-magnet serves to release the wheel-train which supports the carbon-holder upon an abnormal increase of arc resistance.

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